SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LIII.—No. 14. [NEW SERIES.] NEW YORK, OCTOBER 3, 1885. [$3.20 per Annum. [POSTAGE PREPAID.]

FLOATING DEPOSITING DOCK AND HYDRAULIC GRID DOCK.

Those who have inspected the stand of Messrs. Clark & Standfield, of 6 Westminster Chambers, London, at the Inventions Exhibition, will agree with us that floating dry docks and docking accommodation are eminently well represented there. The exhibits of this firm consist mainly of drawings, photographs, and working models of the several systems of docks and hydraulic canal lifts which have been designed and carried out by them at various ports, both at home and abroad. It is not our intention to enumerate the numerous exhibits, but rather in the present and succeeding articles to describe and illustrate the leading practical applications of Messrs. Clark & Standfield's system of depositing dock.

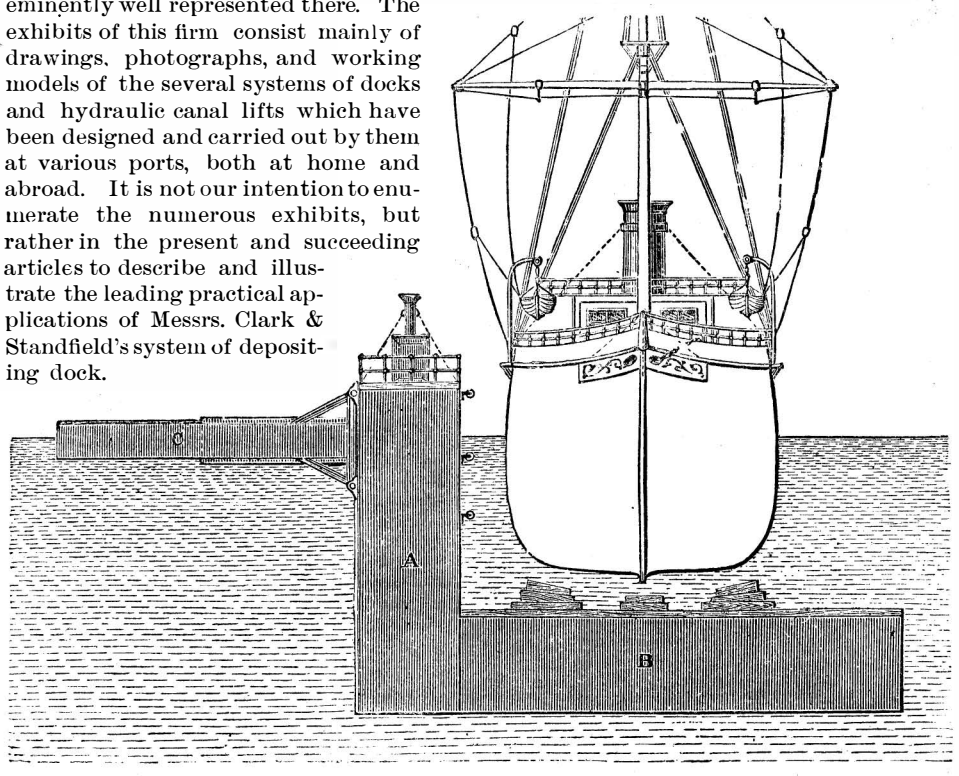

Fig. 2.

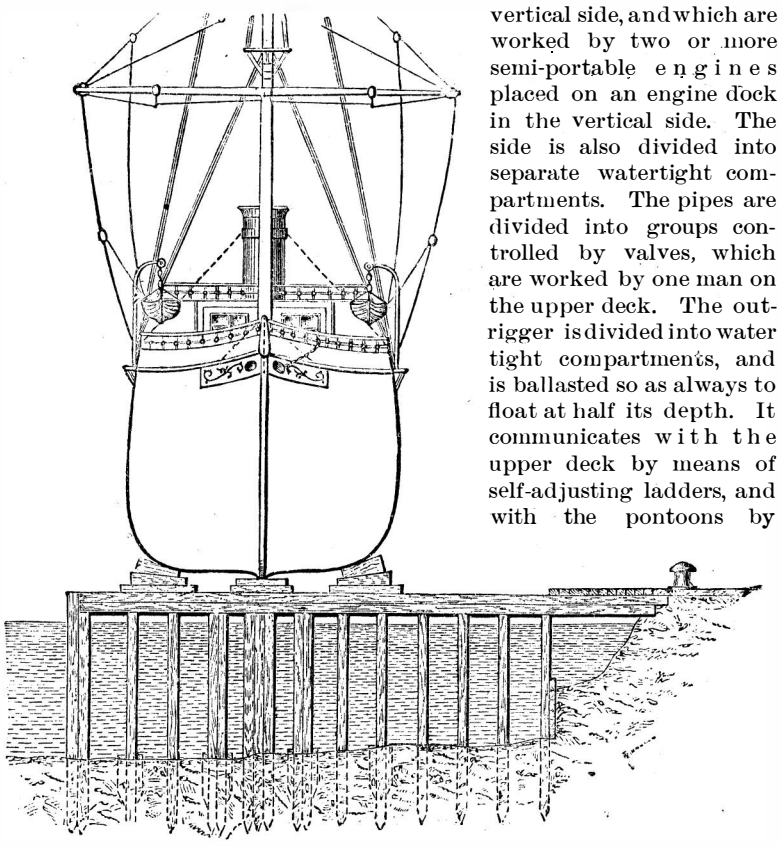

Fig. 3.

FLOATING DEPOSITING DOCK AND HYDRAULIC GRID DOCK.

In our present notice we confine ourselves to a general description of this dock and the hydraulic grid. Fig. 1 of our engravings represents a general view of a naval establishment provided with Clark & Standfield's gridiron stage and depositing dock. Figs. 2 and 3 illustrate the details and the working of the system. The depositing dock has the very great advantage that, by means of its staging, it can accommodate any number of vessels at the same time, as shown in the general view. It is particularly suited for use in wet docks, and in sheltered harbors where there is a pretty constant water level. Its unusual form, and the manner of its working, will be easily seen by referring to our illustrations. The end elevation, Fig. 2, shows it to be an L-shaped dock, that is, having only one side. The broad, shallow pontoon attached on the left of the vertical side of the dock is called the outrigger. Its function is to keep the dock horizontal while being lowered or raised. The stability given by the outrigger is quite equal to that of a dock with two sides.

The bottom consists of a series of parallel fingers or pontoons, firmly connected to the vertical side, but quite free at the outer ends. These pontoons are divided into several watertight compartments by means of internal bulkheads. Some of these compartments are permanently closed, so that it is impossible to sink the dock. Each compartment has independent pipe connection with the pumps, which are situated in wells close to the bottom of the vertical side, and which are worked by two or more semi-portable engines placed on an engine dock in the vertical side. The side is also divided into separate watertight compartments. The pipes are divided into groups controlled by valves, which are worked by one man on the upper deck. The outrigger is divided into water tight compartments, and is ballasted so as always to float at half its depth. It communicates with the upper deck by means of self-adjusting ladders, and with the pontoons by means of gangways passing through the side of the dock. It forms a convenient store for tools and materials.

When the dock has been lowered by admitting water in the usual manner, the vessel is brought over the pontoons, and readily centered by means of movable shores, which are easily controlled from the upper deck. Sufficient water is then pumped out to cause the vessel to take a bearing on the keel blocks on the pontoons. The bilge blocks, which are also worked

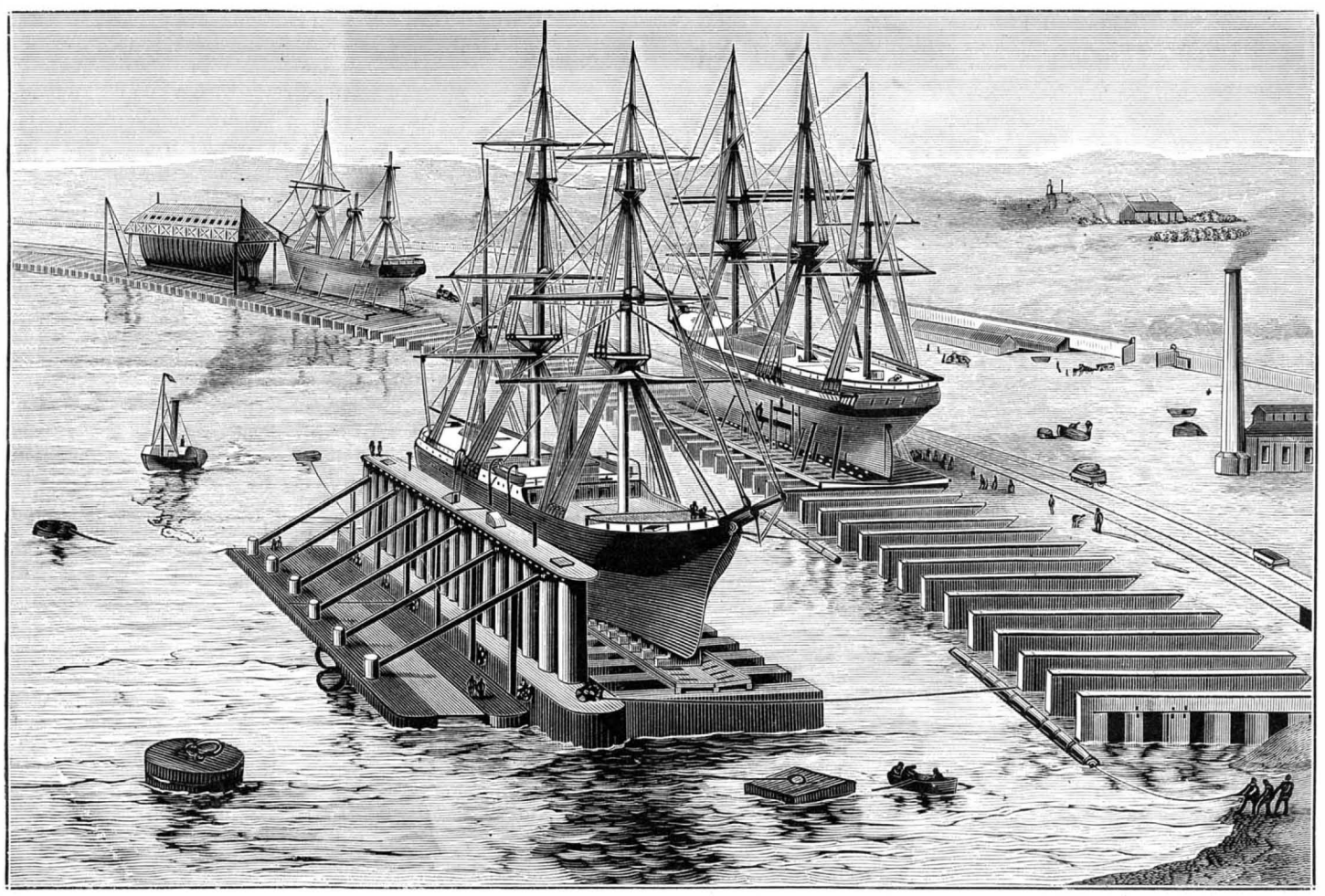

Fig. 1.—FLOATING DEPOSITING DOCK AND HYDRAULIC GRID DOCK.

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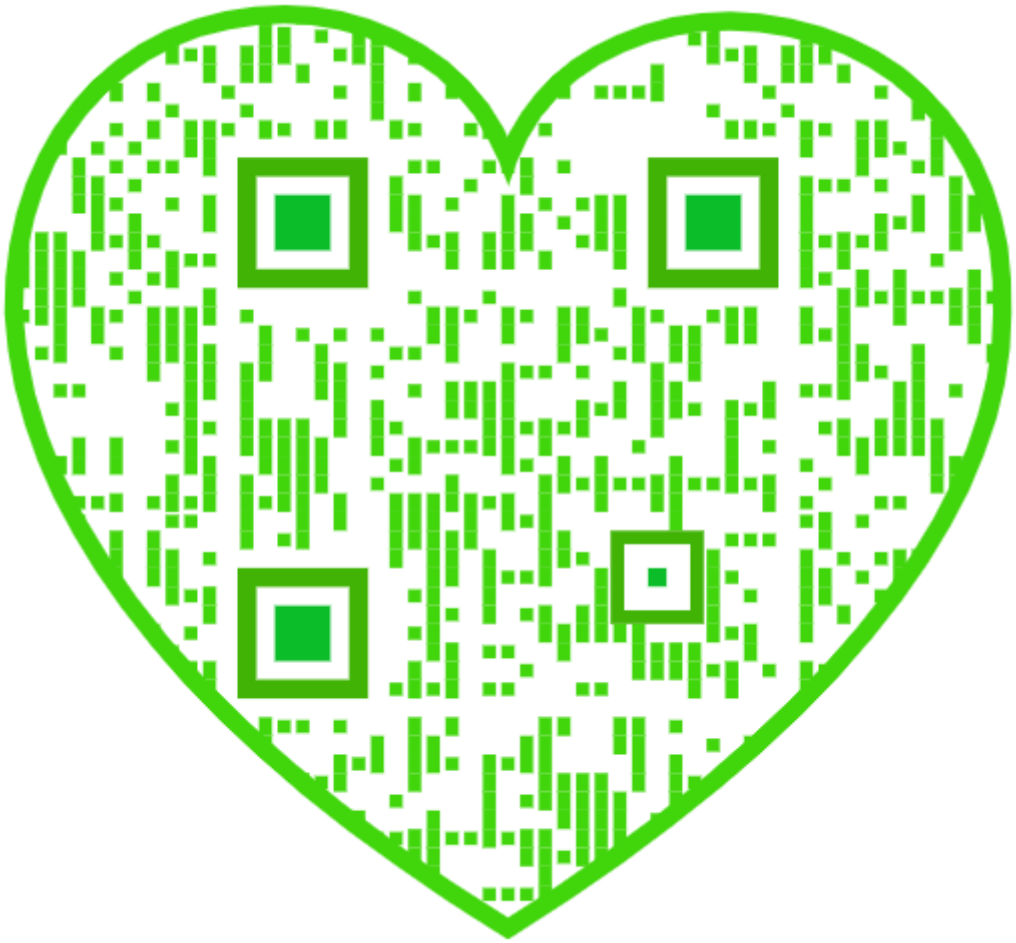

from the upper deck, are then brought into position, and the vessel is thus secured. Pumping is then continued until the vessel is raised clear of the water. These adjustable bilge blocks are very broad, and form an unusually firm cradle, which cannot be displaced even when struck by a heavy sea. The lifting power of the dock is obtained from the pontoons only, the buoyancy of the vertical side sustaining merely its own weight.

The special feature of this dock, from which it has been named, is seen in the next operation, viz., that of depositing the vessel on the staging. Fig. 3 shows an end elevation or section of the staging, which is formed of parallel rows of vertical piles of iron or timber, capped by horizontal timbers. These rows of piers, which are erected at right angles to the shore line, are 4 or 5 feet broad, and from 12 to 15 feet apart. To deposit the vessel, the dock is brought up to the staging, and its pontoons passed between the piers. The keel of the vessel passes clear above the middle line blocks on the staging, the outer blocks being temporarily turned down. As soon as the vessel has been brought over the keel blocks on the staging the dock is lowered, the vessel takes her bearing, the bilge blocks are immediately drawn in in the dry, and the dock is withdrawn, ready to raise or lower another vessel. A few feet variation in the level of the water can always be accommodated by the use of more or less blocking, and vessels of any breadth, however great, can be raised and deposited with the utmost facility. The operation of lowering a vessel from the staging into the water is necessarily the exact reverse of that of raising, which has been fully described.

It will be seen that the depositing dock is specially suitable for large commercial ports where many vessels have to be docked, as one dock can serve any number of vessels; the number of vessels that can be accommodated is, in fact, limited only by the length of staging provided. The dock is very economical in its working, and requires much less pumping to be done than an ordinary stone dock. When a vessel is on the staging, it is fully exposed to light and air, and is in an exceptionally favorable position for being painted or repaired. The depositing dock is constructed in two equal portions, each furnished with engines, pumps, etc., complete, so that each portion can be used as an independent dock for smaller vessels; each portion can also at any time be docked on the other portion without any heeling over, so that all parts are readily accessible for cleaning and painting, thus enabling the dock to be kept in the most thorough preservation. The staging can be erected in comparatively shallow water, as it is not necessary to have a much greater depth than the draught of the dock with the vessel on it, say from 10 to 15 feet; but where the vessels are raised or lowered, which can always be done at the same spot, there must be a depth equal to the depth of the pontoons added to the draught of the vessel. Vessels can, with advantage, be built on the staging, and lowered into the water at a very small cost, without any rolling or sliding motion, and without running the risk of straining incurred by launching. The time occupied in docking a vessel of any size need not exceed one hour, and in lowering half an hour; a vessel can, of course, be raised, sighted, and refloated in less than two hours. The following are among the chief advantages of the depositing system: 1. One dock can accommodate any number of vessels by means of staging, which can be erected along the waste shores of a river or wet dock. 2. The dock can take a vessel of any size, and of a breadth too great to enter any other fixed or floating dock. 3. Each half of the dock is complete in itself, and can be used as an independent dock for smaller vessels, and for docking the other half. 4. Each additional length of staging provides the accommodation of an additional graving dock at a very small cost. 5. Vessels can be built on an even keel on the staging, and can be lowered into the water without any strain, avoiding the risk and cost of launching, and saving the space required for a slip. 6. The dock, either with or without a vessel, can be towed from place to place, for the purpose of docking and depositing vessels at different points. 7. The dock cannot sink, even if all its valves be left open by accident or intention. 8. The dock can at any time be enlarged as occasion may require at the same rate per ton as its original cost. 9. With sufficient staging, one of these docks can accommodate a very great number of vessels daily, and can, therefore, earn a very much larger dividend than any other form of dry dock.

We may add that in 1876 Messrs. Clark & Standfield constructed for the Russian government a large depositing dock. The firm have also constructed a depositing dock at Barrow, to dock vessels up to about 3,200 tons displacement, and also another dock for the Russian government, to dock vessels up to about 8,000 tons displacement.—*Iron.*

THE following is a good remedy for burns: Mix 4 ounces of the yolk of eggs with 5 ounces of pure glycerine. This forms a kind of varnish.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, OCTOBER 3, 1885.

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A NEW PHASE IN THE TELEPHONE LITIGATIONS.

It will be seen from an interesting article, with details, given in our this week's SUPPLEMENT, that a new and peculiar form of attack has been commenced against the Bell Telephone Company, being a suit brought in the name and at the cost of the Government of the United States to break and annul the original Bell patent. One peculiarity of the case is that the Attorney-General, by whose authority the suit is brought, is, or was lately, deeply interested in the stock of a rival telephone company that will shortly be enjoined and probably ruined, unless saved by this new legal dodge. Another curious feature is that, in this new suit, the Attorney-General has appointed as the lawyers to represent the Government the same lot of lawyers who have heretofore defended and been paid by the Attorney-General's telephone company. Thus, by favor of the Department of Justice, the lawyers of the Attorney-General's telephone company will continue to battle for his interests, but will in future draw pay from the Treasury of the United States.

We are among those who regard the Bell patent as an illegal monopoly. We believe the lower court, through some misintrepretation of evidence or failure in its presentation, awarded to Bell a discovery that, in truth and justice, belonged to another man. Phillip Reis, in 1860, was the original and first inventor of the electric telephone; he gave the invention to the public in several forms many years before Bell's device was made; his inventions were known to Bell; and now, at this late day, to have the inventions of Reis wrenched from the people and converted into a vast monopoly for the enrichment of private individuals seems like a mockery of justice.

The manner of its accomplishment is about as follows: In the first suit judge number one, on the meager evidence then presented, concluded Reis' telephone to be good for nothing, and held Bell's patent to be valid. In the second case, judge number two would not hear additional evidence concerning Reis, as the subject had been already decided. In the third case, judge number three declined to hear the evidence for similar reasons. In the fourth case, judge number four reaches the same result; he agrees it would not be polite to the other judges to rule differently. Thus the several judges, although only one investigation of evidence has been made, have ranged themselves like so many fences, one behind the other; and the Bell people, in addition to their patents, practically control the art of transmitting speech to the ears of the judges of the lower courts.

Unsatisfactory as this state of things appears, it is, nevertheless, strictly in accordance with legal forms and precedents, and affords no shadow of justification for the scandalous spectacle which the Department of Justice is now making of itself.

Patentees are interested in this matter without regard to what they may think of this particular patent of Graham Bell. If the United States will lend its wealth and influence to carry on litigation and encourage infringement of a patent sustained by all the circuit courts, and do this upon alleged defenses which have been passed upon, and in favor of those who can avail of them in actually pending suits, but who happen to have special personal relations with the Attorney-General, and do this on *ex parte* presentation of the case, invention and a patent will no longer confer rights, and decisions of the courts can no longer, sustain nor protect them.

STILETTO AND ATALANTA.

It will be remembered that early in July it was announced that the Stiletto had won the race over the ninety mile course from Larchmont to New London. The race was very close, but it was supposed that she had beaten the Atalanta by several minutes. Mr. Gould promptly protested against the decision, on the ground that the Stiletto, probably by mistake, had left the prescribed course, and near the finish had gone inside instead of outside of a certain buoy. A committee was appointed by the American Steam Yacht Club to investigate the charge, and after hearing rather a voluminous testimony on the subject, decided in Mr. Gould's favor, and awarded the challenge cup to the Atalanta.

This decision has called forth a challenge from Mr. Herreshoff for another race between the two steam yachts, over a hundred mile course on the Hudson, from New York fifty miles up river and back again. The proposed stake is a new championship cup, to be held by the winning boat until her record is surpassed. Mr. Gould has intimated his willingness to accept the challenge, if an open water course, such as that on the Sound, over which the disputed race took place in July, be selected instead of the Hudson, as the Atalanta, it is stated, is only allowed to run at three-fourths speed on the river, on account of the numerous craft encountered, and in passing a flotilla of tow boats is obliged to slow down or even to come to a full stop, while the smaller yacht circles around them at full speed. Moreover, the Atalanta, on account of her size, requires fifteen minutes to turn about, while the Stiletto can turn in two. These conditions

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would manifestly make a river race in two directions unfair to the Atalanta; and since the disputed race came off on the Sound, the second trial would seem more conclusive if made over the same course.

PNEUMONIA AND OZONE.

Dr. Draper, of the Meteorological Observatory at Central Park, New York city, has called attention to the fact that during the past eight years there has been an apparent connection between the death-rate from pneumonia in New York and the presence of ozone in the atmosphere. The epidemic has been particularly fatal during the present year, and it is stated on good authority that the death-rate from this cause has exceeded that from cholera in 1854. It has not been determined whether the connection between the disease and the ozone in the air is simply a coincidence, or whether there are scientific reasons for their joint appearance.

We know as yet but little about either the cause of the disease or of the modified form of oxygen which we denominate as ozone. In pursuing an investigation to discover their true relation, should any be found, two cases are possible: either that the ozone, which in large quantities we know to be injurious to health, is the direct cause of the disease, or that the same atmospheric conditions which produce ozone are also favorable to the spread of pneumonia. We are inclined to believe that the connection is purely accidental, but of the two hypotheses, the latter seems the more tenable, though Dr. Draper has apparently given it no consideration.

ASPECTS OF THE PLANETS FOR OCTOBER.

SATURN

is morning star. He takes the leading part among his brethren, for a noteworthy epoch occurs in his long journey round the sun. He reaches perihelion, or his nearest point to the sun, on the 21st, at 7 o'clock in the morning. As this event occurs only once in nearly thirty years, it must rank as a high festival in the solar family.

The sun and the member of his family who is second in size, and first in the surpassing beauty of his system, make their nearest approach to each other. It is 29½ years since their last meeting under similar conditions. During that time, Saturn has traveled more than five thousand million miles in making his vast circuit around the sun, and now looks the great luminary in the face from a standpoint 100,000,000 miles nearer than when, fifteen years ago, he passed aphelion or his most distant point from the sun.

Figures give little idea of distances to finite minds when trying to form an idea of the space that intervenes between our planet and one that revolves in an orbit of vast circumference like that of Saturn. The difference even between his least and greatest distance from the sun is greater than the whole distance that separates us from the mighty orb on whom all the planets depend for life and light.

The reason for the varying distance of the planets is easily understood. Each planet moves in an elliptical orbit, the sun being in one of the foci of the ellipse. There must be a point in each orbit where the planet is nearest to the sun, or in perihelion, and also a point where the planet is farthest from the sun, or in aphelion. Saturn illustrates the former condition and Venus the latter during the present month. The ellipticity of the orbit, or the eccentricity, as it is called, varies greatly in the different planets. Mercury has the greatest eccentricity, Mars comes next, and Saturn takes the third place, while Venus has the least, her orbit being nearly circular.

The perihelion of Saturn is an important astronomical event, and has been anticipated for years with eager interest. But why should the nearest approach of this planet to the sun be of so much consequence to terrestrial observers? is a question that naturally arises to thoughtful minds. It is because when Saturn is nearest to the sun, he is, under certain conditions, nearest to the earth, and the approach is easily perceptible in his increased size and greater brilliancy. There are three conditions that, when united, give the best possible views of Saturn. He must be in perihelion, his rings must be open to their widest extent, and he must be in opposition, or Saturn, the earth, and the sun must be in a straight line, with the earth in the middle. These three conditions are nearly united in the present position of our magnificent brother in regard to the earth. He is in perihelion, his rings are open to their widest extent, and he is within two months of opposition, as well as in high northern declination.

Nearly a whole generation will pass away before Saturn will again be seen under conditions as favorable as those he now presents. Instead of a dull, murky, and ill-omened star, he shines with a soft and serene light, that gives him a pre-eminence among the surrounding stars, and brings out the best aspect of the planet that ranks as second in the solar scheme. His proximity increases his size, and his wide open rings give him an elliptical form to eyes blessed with exceptional visual power. It is field day with astronomers, who will eagerly improve the rare occasion in searching for new satellites, in seeking to find out what the rings are made of, and in tracing the shadowy belts on the planet's disk.

No guide will be needed to point out Saturn's position in the heavens. He rises on the 1st, in the northeast, about 10 o'clock, and cannot fail to be recognized by any observer who commands a view of the eastern horizon. He will rise about four minutes earlier every evening until the end of the month, when his beaming face will be visible soon after 8 o'clock. He is still classed among the morning stars, although he rises early in the evening. For according to astronomical law, planets on the western side of the sun rank as morning stars, those on his eastern side rank as evening stars. Saturn will be on the western side until opposition in December.

He is in quadrature with the sun on the 1st, at 1 o'clock in the morning, being 90° west of the sun, and half way between conjunction and opposition. He has been traveling eastward or in direct motion for several months, but is stationary about the time of perihelion.

The right ascension of Saturn on the 1st is 6 h. 15 m.; his declination is 22° 18′ north; his diameter is 17·4″; and he is in the constellation Gemini.

Saturn rises on the 1st about a quarter after 10 o'clock in the evening; on the 31st he rises a quarter after 8 o'clock.

VENUS

is evening star. As we classify the planets in the monthly presentation according to the interesting incidents they supply for observation, Venus easily wins the second place on the October list. She grows more beautiful all the time as she recedes from the sun, while her increasing distance being now plainly perceptible in the longer time she remains above the horizon after his departure. When the month closes, she will set two hours and a quarter after sunset. She will be the gem of the early evening sky in October, wending her shining way in the southwest, and leaving but one regret, that her path is not further north while she takes on her present lovely aspect. She has passed near several first magnitude stars since she became evening star, paying her respects to Regulus in July, Spica in September, and she will be near Antares in October, on the 16th, being 3° north at the time.

Venus is in aphelion on the 16th at 10 o'clock in the evening. Her eccentricity, however, is so small that her orbit is considered circular for all ordinary purposes.

The right ascension of Venus on the 1st is 14 h. 57 m.; her declination is 18° south; her diameter is 15·2″; and she is in the constellation Libra.

Venus sets on the 1st about 7 o'clock in the evening; on the 31st she sets at nearly the same time.

MARS

is morning star. He rises about a half hour after midnight, and varies little in his time of rising during the month. He may be found at the close of the month a little way northeast of Regulus, and is visible as a small red star.

The right ascension of Mars on the 1st is 8 h. 48 m.; his declination is 19° 3′ north; his diameter is 5·4″; and he is in the constellation Cancer.

Mars rises on the 1st about a half hour after midnight; on the 31st he rises a few minutes after midnight.

JUPITER

is morning star. He is too near the sun to be of much consequence at present. But he is making his way rapidly to visibility, and when the month closes, he rises more than three hours before the sun.

He is in conjunction with Beta Virginis on the 21st, at 2 o'clock in the afternoon. Observers will not be much the wiser for this meeting of planet and star, but it takes place just as surely as if it were as plainly visible as the rising of the moon.

The right ascension of Jupiter on the 1st is 11 h. 29 m.; his declination is 4° 26′ north; his diameter is 29·6″; and he is in the constellation Virgo.

Jupiter rises on the 1st a quarter after 4 o'clock in the morning; on the 31st he rises a quarter before 3 o'clock.

MERCURY

is morning star until the 16th, and then evening star. On the 16th, at 5 o'clock in the morning, he is in superior conjunction with the sun, having completed one of his swift circuits from superior conjunction to superior conjunction again in 115 days, his synodic period.

On the 4th, at 8 o'clock in the evening, he is in conjunction with Uranus, being 1° 13′ north.

The right ascension of Mercury on the 1st is 12 h.; his declination is 2° 3′ north; his diameter is 5·2″; and he is in the constellation Virgo.

Mercury rises on the 1st about a quarter before 5 o'clock in the morning; on the 31st he sets at 5 o'clock in the evening.

URANUS

is morning star. He is too near the sun to be of any interest to students of the stars. His monotonous course is, however, enlivened by a meeting with Mercury on the 15th.

The right ascension of Uranus on the 1st is 12 h. 14 m.; his declination is 0° 49′ south; his diameter is 3·4″; and may be found in the constellation Virgo.

Uranus rises on the 1st a quarter after 5 o'clock in the morning; on the 31st he rises at half past 3 o'clock.

NEPTUNE

is morning star.

The right ascension of Neptune is 3 h. 33 m.; his declination is 16° 22′ north; his diameter is 2·6″; and he is in the constellation Taurus.

Neptune rises on the 1st about half past 7 o'clock in the evening; on the 31st he rises about half past 5 o'clock.

THE MOON.

The October moon fulls on the 23d at 4 h. 22 m. P. M. The moon is in conjunction with Saturn on the 1st at 6 h. 9 m. A. M., shortly before the last quarter, being at the time 4° 15′ south. She is in conjunction with Mars on the 3d, at 2 h. 5 m. P. M., being 5° 4′ south. She encounters Jupiter on the 6th, at 11 h. 49 m. A. M., being 1° 25′ south.

There is a very close conjunction or an appulse between the moon and Uranus on the 7th, at 6 h. 56 m. A. M., the moon being only 6′ north of the planet. She is in conjunction with Venus on the 11th, three days after new moon, at 6 h. 39 m. A. M., being 6° 23′ north. On the 25th, at 8 h. 58 m. A. M., she is at her nearest point to Neptune, being 2° 44′ south. She is in conjunction with Saturn a second time on the 28th, at 0 h. 4 m. P. M., being 4° 7′ south, and with Mars on the 31st at 11 h. 7 m. P. M., being 4° 15′ south.

OCTOBER'S

starlit sky presents one prominent subject for observation and study. It is the perihelion of Saturn. The sun and the most richly gifted of his sons are at their closest point of approach, 100,000,000 miles spanning the distance that intervenes between Saturn's perihelion and aphelion. Fortunately the earth approaches that point of her orbit where her path lies almost between the sun and Saturn, and she profits largely by the proximity, for the increased size and clear radiance bear testimony to the nearer neighborhood of the ring-girdled planet. It seems absurd, however, to speak of the nearness of an object whose mean distance from the sun is 881,000,000 miles. We are at sea, without a pilot, in seeking to comprehend dimensions where a million miles is the measuring unit. But we can see results in the beauty and brightness of a planet that fifteen years hence will shine with a dull, murky light in striking contrast with his present serene aspect.

Astronomers who make Saturnian investigation a specialty will improve the present favorable conditions. It will not be unexpected if they find out whether the dark spaces between the rings are merely shadings in or between the myriad satellites that make them up, or even if a ninth moon should be detected faintly gleaming among its brethren.

If twenty-five years exhausts an astronomer's highest power of observation, before Saturn's return to perihelion in 1915 observers who are now in their golden prime will have lost their power to see clearly, observers who are just entering the astronomical field will rejoice in the maturity of visual strength, and observers who are but children now will become aspirants for the laurels the heavens bestow on those who devote their life work to the study of celestial mysteries.

Nearly a generation of those who now tread the earth will sleep peacefully in its bosom, while this wonder of the skies traverses the vast path that forms his circuit round the sun. A generation of men lives and dies in one Saturnian year!

Well may it be said that the study of astronomy promotes humility, teaching, as no other science can, the insignificance of humanity!

What is our earth with her one moon in the material scale by the side of the magnificent Saturn with his rings, moons, and belts? We may, however, find consolation for our littleness in the thought that the earth is in her perfection of development, while the primeval fires of Saturn still burn. When animate life reigns on this peerless planet, the earth, according to the law of inevitable decay, will be a dead world, cooled down to the condition of our satellite, where life and moisture are unknown. Mars and Mercury will perhaps succumb to the same law before the earth, on account of their smaller dimensions, while Venus will keep pace more nearly with her twin sister. The four great planets will then rejoice in physical perfection, and take the place now occupied by their more insignificant brethren. But millions of years will be required to effect these changes, and the inhabitants of this little planet can meanwhile behold the process of world making on the larger planets, and the process of decay on the smaller ones, while they wait patiently for what is to come.

Vulcan Hammers for Sweden.

Wm. P. Duncan & Co., of Bellefonte, Pa., have just shipped an 80 lb. Vulcan power hammer to Sweden, and are constantly receiving orders in this country. This hammer is growing in favor every day.

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TRICYCLE HOBBY HORSE.

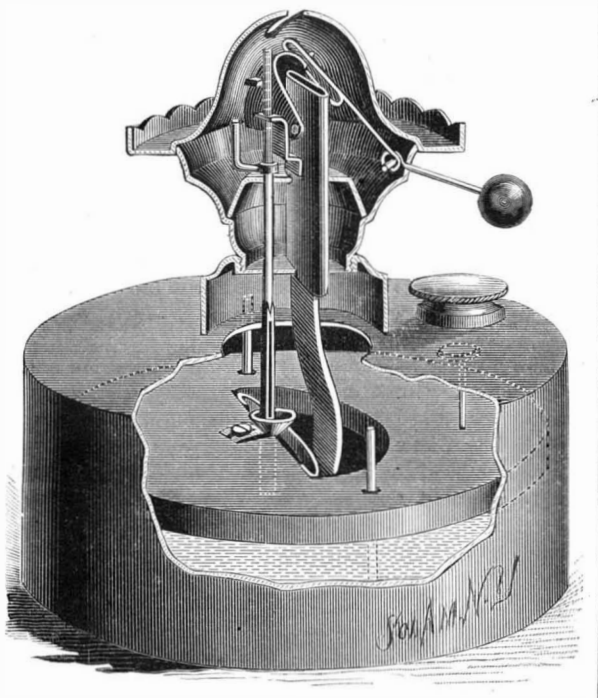
The hobby horse herewith illustrated can be operated in the same manner as a tricycle. The handle shaft is arranged to turn in the hobby horse at the base of the neck, and on its lower end is secured a fork, the shanks of which are shaped like a horse's front legs. Journaled in the lower ends of the shanks, is a shaft having a crank, provided with a foot rest, at each end. The front wheel is rigidly mounted on the shaft between the shanks. Rods pivoted to the shanks at their upper ends are connected by rods with the ends of the cranks; if desired, these rods may have the shape of a horse's front legs. Rods having their upper ends held to the sides of the horse's body at the rear extend downward

HEILMAN & PERKINS' TRICYCLE HOBBY HORSE.

and outward, and in their lower ends the rear axle is journaled. The rear axle is formed with two cranks on which are pivoted rods connected by bars with the sides of the horse body. The hobby horse is operated precisely like a tricycle, the rider's feet resting upon the treadles. Steering is effected by turning the fork by means of its rod and handle. The movements of the jointed bars resemble the moving front and rear legs of a horse. This invention has been patented by Messrs. R. P. Heilman and R. B. Perkins; particulars can be obtained by addressing the former at Emporium, Pa.

AUTOMATIC LAMP EXTINGUISHER.

The engraving shows a lamp extinguisher that automatically extinguishes the flame at any desired time after the lamp has been lighted. Guide rods projecting upward from the bottom of the fount pass through holes in a float formed with a large central aperture, one edge of which is straight. A wire bow spring is secured to the straight edge of the aperture, and a metal clip formed with a funnel-shaped part is held on the top of the float in such a manner that the funnel projects beyond the straight edge. A rod having a round upper and flattened lower part passes through both the burner and funnel. To the upper



BURGESS' AUTOMATIC LAMP EXTINGUISHER.

part of the rod, which is graduated, is attached an angular handle, by means of which the rod may be turned. The upper end of the rod rests against a guide lug on the side of the wick tube. A cap is pivoted to the sides of the wick tube in such a manner that it can swing over the top of the tube and cover it. A lever pivoted in the burner shell has a weight at its outer end, and its inner end is formed into a lengthened loop, through which passes a pin projecting from the side of the cap.

To adjust the extinguisher, the rod is pulled upward until a lug on the cap is at the desired mark of the rod; the cap is then held off the wick tube, and the weight is raised. The handle piece is then moved until the flat portion of the rod is at right angles to the straight edge of the opening, when the spring will firmly hold the rod to the float. The rod can be moved up and down when its flat portion is parallel with the straight edge. The rod descends with the float, and when its upper end passes under the lug, the cap is released and is swung by the weight over the wick tube, thereby extinguishing the lamp. It is immaterial how full the fount is, as the rod and float can be locked together at any time. When the fount is being filled, a pin rising from the float just beneath the filling neck shows the height of the oil.

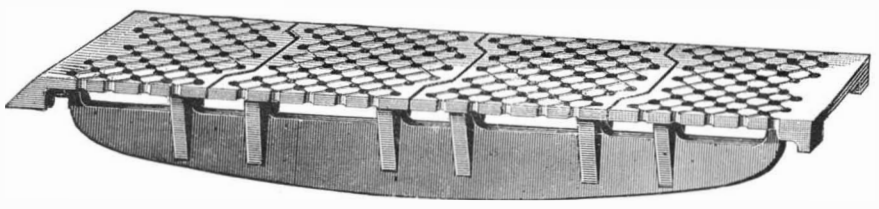
This invention has been patented by Mr. W. Scott Burgess, of Marathon, N. Y.

Solder for Glass, Porcelain, and Metals.

A soft alloy which attaches itself so firmly to the surface of metals, glass, and porcelain that it can be employed to solder articles that will not bear a high temperature can, as the *Pharmaceutical Record* asserts, be made as follows: Copper dust obtained by precipitation from a solution of the sulphate by means of zinc is put in a cast iron or porcelain lined mortar and mixed with strong sulphuric acid, specific gravity 1·85. From 20 to 30 or 36 parts of the dust are taken, according to the hardness desired. To the cake formed of acid and copper there is added, under constant stirring, 70 parts of mercury. When well mixed, the amalgam is carefully rinsed with warm water to remove all the acid, and then set aside to cool. In 10 or 12 hours it is hard enough to scratch tin. If it is to be used now, it is to be heated so hot that when worked over and brayed in a mortar it becomes as soft as wax. In this ductile form it can be spread out on any surface, to which it adheres with great tenacity when it gets cold and hard.

IMPROVEMENT IN GRATE BARS.

The grate bar shown in the cut consists of a perforated and grooved top plate divided into a number of sections having narrow spaces between their adjacent ends. The sectional plates are cast upon lugs which are cast upon the supporting rib, thus allowing the air to freely circulate through and around the top plates; this secures thorough combustion of fuel, and by equalizing all strain resulting from expansion and contraction, prevents warping and insures long service. The perforations in the plates can be regulated to any size or kind of fuel, and we are assured that culm or coal dirt has been and is burned on this bar with great success. The surface of the grate is always level—making an even fire—and there are no ends or tilted bars to be broken off by the scraper in cleaning the fire. This bar, the invention of Mr. Joseph B. Miller, 407 South Main St., Wilkesbarre, Pa., is used extensively in furnaces throughout the coal regions.



MILLER'S IMPROVED GRATE BAR.

Removing Hair and Freckles by Electricity.

The American Dermatological Association lately held its ninth annual meeting at Greenwich, Conn. Among the proceedings were remarks by various doctors who gave their experiences in removing hair from the face by electricity. Quite a large and important business is done in this line, especially among ladies. The only remedy is to kill the root of each hair, which must be done separately, by means of an electrical needle and battery.

Dr. Fox said: In the case of a young woman with a heavy beard, he had removed, by actual count, eight thousand hairs. This process had required two or three years. Since then it had been necessary to remove only a few dozen hairs.

The president, Dr. Hardaway, had performed the operation of electrolysis for ten or twelve years, probably longer than any other member of the association. He used the irido-platinum needle, which had the advantage of being bent, and was not likely to pass through the follicle wall. The moment the follicle was entered, there was an escape of sebum. One case, that of a woman with a heavy black beard, had been entirely relieved. Electrolysis with a fine needle afforded a method of getting rid of freckles. The plan was to dot the surface covered by the freckle with the needle.

FRECKLES.

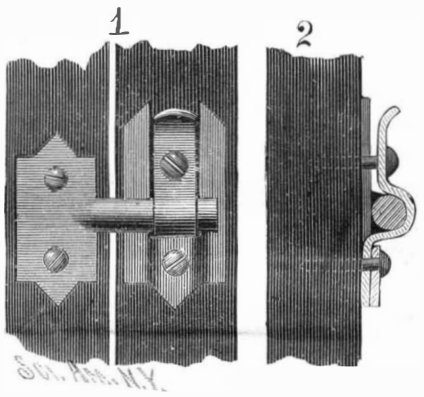
The following ointment was recommended by Dr. Heitzman and others at the late Greenwich meeting of the American Dermatological Association, being an ointment recommended by Wertheim, of Vienna:

White precipitate, Subnitrate of bismuth	each	1 drachm.
Glycerine ointment		1 ounce.

This was to be applied in a thin layer every other night, and in from four to six weeks the result would be found to be highly satisfactory.

SPRING FRICTION MIRROR PIVOT.

The object of this invention is to provide an effective spring friction hinge for hanging mirrors, transom lights, and for other similar uses. The base plate is formed with a longitudinal slot, and is grooved on its under side to receive the end of a spring which is shaped as shown in the sectional view; the lower portion of the spring forms a loop for receiving a pivot, and the



BREITHUT'S SPRING FRICTION MIRROR PIVOT.

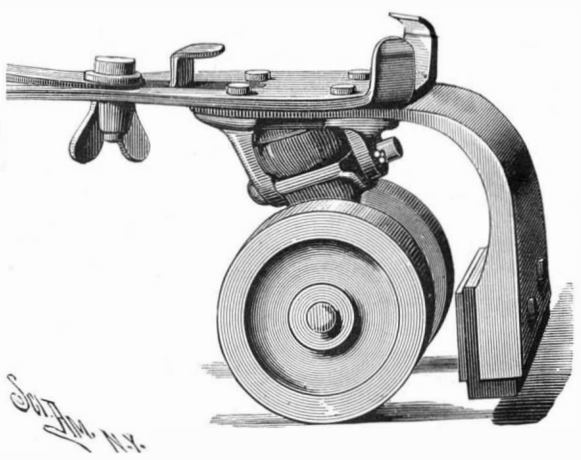
upper portion is turned outward to admit of readily inserting the pivot between the spring and plate. The plate and spring are held to the supporting frame of the mirror or transom by a screw. A second screw passes through a hole in the spring above the pivot, and serves to draw the spring around the pivot, so as to produce more or less friction, to cause the frame to which the pivot is secured to remain in any desired position. By removing the upper screw from the spring the pivot may be raised out of the hinge or replaced therein. It will be seen that by this construction the mirror or transom frame can be easily removed or replaced by one person.

This invention has been patented by Mr. Oscar P. Breithut, of 58 William St., Williamsport, Pa.

STOP ATTACHMENT FOR ROLLER SKATES.

By the use of this attachment on any roller skate the advance of the skater can be readily checked; it also serves as a safeguard to prevent the skater from falling backward. To the lower side of the rear end of the main plate is secured a plate made of steel or other suitable material. This plate curves downward in the rear of the rollers, and is of such length that its lower end will be near the floor when the rollers rest upon the floor. The side edges of the plate project forward to strengthen it, and to form a recess to receive a block of rubber which is held in place by screws and rivets. When the skater wishes to stop, he raises the forward part of the skate a little, thereby bringing the rubber block in contact with the floor, when the friction checks further progress.

This construction also overcomes the danger



GERAN'S STOP ATTACHMENT FOR ROLLER SKATES.

of falling backward, since the raising of the forward part of the foot brings the rubber against the floor, stops the forward movement of the skate, and enables the skater to maintain his equilibrium. This invention has been patented by Mr. J. P. Geran; further information can be had from Judge Garret Bergen, P. O. box 81, Brooklyn, N. Y.

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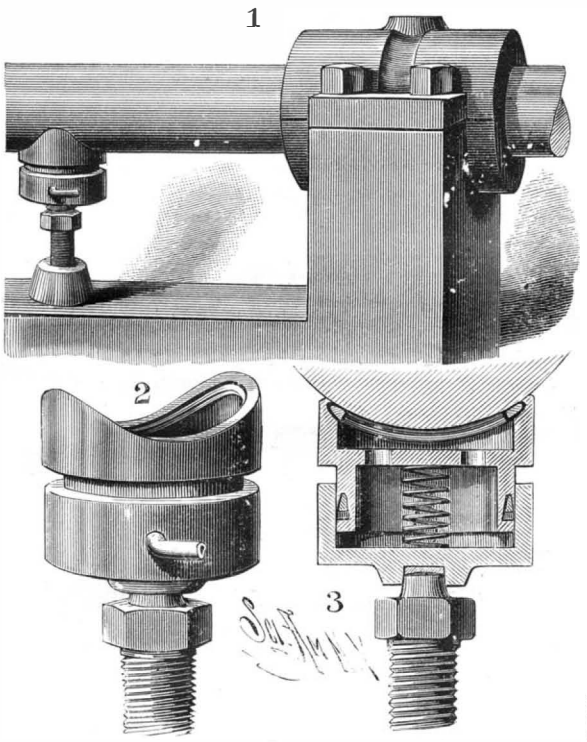
SUPPORTING AND END THRUST ANTI-FRICTION PADS FOR SHAFTS.

The accompanying engravings show an improved supporting pad designed to counteract the effect of the weight and friction of steamship shafts upon their bearings, also the friction on the journals of iron and steel rolling mills, and on all heavy bearings of whatever nature, and also a pad designed to counteract the end thrust of propeller shafts. Both of these devices have been patented, by Mr. Valentine H. Hallock, of Queens, N. Y., in the United States and principal countries of Europe.

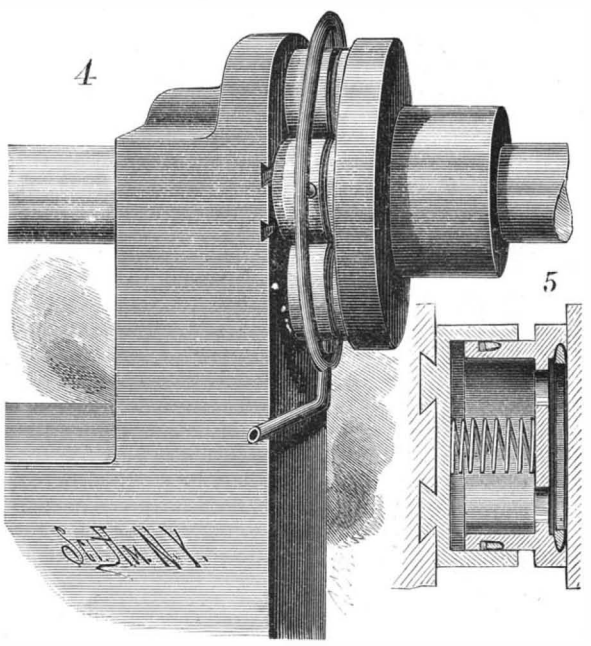


SUPPORTING PAD FOR SHAFTS.

In order to relieve the bearings or journal boxes of the effect of the weight of the shaft, a supporting pad, consisting of two cylinders, one bored out to receive the other, as shown in Fig. 3, is applied to the shaft between the pillow blocks. In the circumference of the upper cylinder is a recess into which is placed leather packing held by a ring. When the pad is charged with water under pressure, the outer section of the packing is forced against the inner surface of the under cylinder, and leakage at that point is prevented. The head of the upper cylinder is provided with holes and with a recess, and its face is concave to fit the surface of the shaft. Leakage between the pad and the shaft is prevented by a leather packing similar to the one already described. The spring shown in the cut serves to keep the head in contact with the shaft when the pad is not charged with water. By means of the screw upon which the pad rests, the latter can be removed from the shaft or can be pressed up against the shaft. The pad is supplied with water by a force pump connected by a pipe with the supply opening of the pad, as shown in Figs. 1 and 2. The pump is furnished with an air chamber and with a safety valve set at the maximum pressure required in the pad; when the pressure reaches the desired limit, the water blows off through the valve. The air in the chamber forms an elastic cushion, whereby the pressure in the pad is rendered yielding to some extent, and the friction between the pad and shaft is reduced to a minimum. The use of this pad materially reduces the wear of the journal boxes, since they are relieved of the pressure usually produced by the weight of the shaft.

When designed to counteract the end thrust—as represented in the second engraving—several pads are secured on the face of the pillow block, and bear against a flange fastened on the shaft. In the cut four pads are shown, but the number may be decreased or increased, according to circumstances. The pads are formed with dovetailed ribs (Fig. 5), which engage with corresponding grooves in the face of the pillow block. The pads are formed of cylinders, one within the other, packed with leather held in place by rings like those above described. Between the outer face of the head of the cylinder and the flange is packing, which prevents leakage at that point. The spring keeps the head in contact with the flange when the pad is not charged with water. The pads are supplied with water by a force pump provided with an air chamber, acting as an elastic cushion, and with a safety valve set to discharge when the maximum pressure is reached. These pads, which may be applied to counteract the end thrust of the shaft in either direction, are reliable in operation, and their use will insure the saving of a large percentage of power. The arrangement of the pipes supplying the pads with water is clearly shown in Fig. 4.

It is claimed that the use of these inventions will result in a saving of both time and power in ocean navigation, and will afford great advantages in overcoming friction in tools used in the manufacture of iron and steel.

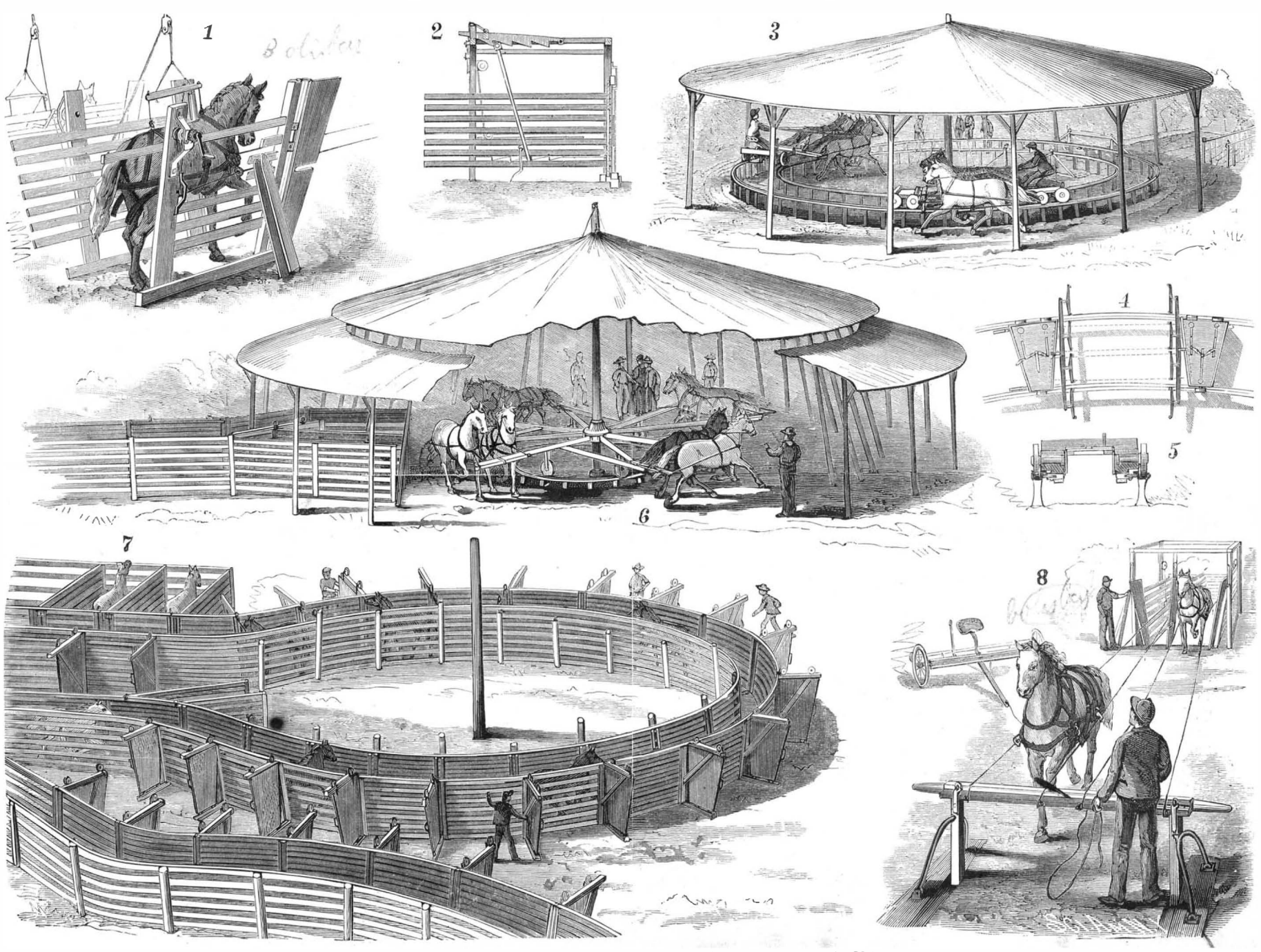


END THRUST PAD FOR SHAFTS.

IMPROVED APPARATUS FOR TRAINING HORSES.

The accompanying engravings represent several appliances so designed as to cover every step in the breaking and training of horses. The apparatus possesses many excellent qualities; it does away entirely with the cruel practice, at present too common, of first lassoing the unbroken horse, then throwing it, and frequently choking and beating until the spirit of the horse is almost broken. The theory embodied in this system is, that kindness and firmness will subdue any animal, and in constructing this apparatus these two points were prominently and constantly before the inventor.

The harness, shown in Figs. 1 and 8, has side pieces or plates for conveniently attaching the horse to sliding pieces placed upon supporting ropes, and is so constructed that it will keep its place upon, and support the weight of the horse, no matter what position he assumes—whether he kicks, plunges, or



SHEDD'S IMPROVED APPARATUS FOR TRAINING HORSES.

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throws himself. The supporting bar is suspended over the stall in which the horse is to be harnessed, by a rope passed over a pulley held above the stall. By drawing downward or letting away upon the rope the harness may be raised from or lowered upon the horse, thus avoiding the necessity of entering the stall. The general arrangement of the harness is shown clearly in the cuts. Each side plate is provided with an eye to which the sliding pieces on the leading ropes may be attached by snaps, so that, the leading ropes being held taut, the horse can be led along the ropes, which, together with the harness, will hold him from rearing and kicking, and will support him in case he should throw himself. To prevent the horse from throwing his weight upon the supporting ropes, the forward belly-band is formed with one or more points so arranged as to prick the horse and compel him to stand up if he should put his weight upon the belly-band; of course, the points are normally held away from the horse.

The rear ends of the supporting ropes are fastened to a shaft in the stall, and provided with pawl and ratchet attachments, which prevent the shaft from turning back when the ropes are wound upon it. The outer ends of the ropes are secured to a neck yoke placed upon posts (Fig. 8) hinged in recesses made in the floor. The posts are held in a vertical position by curved bails hinged to the floor; when tipped back, the bails enter curved recesses cut in the floor. When down, the posts and bails lie flush with or below the floor. The head doors of the stall being closed and locked, the horses are run into the stalls, and the rear door closed behind them. After having been harnessed, the head doors are opened and the horses led along the supporting ropes to the neck yoke, to which they are attached alongside of two well trained horses. The vehicle is now drawn forward by a central rope, and the tongue placed in the ring of the neck yoke. The horses are then attached to the whiffletrees of the vehicle, and the supporting ropes are detached from the winding shaft and attached to cleats of the vehicle. The neck yoke is disconnected from the posts, which, together with the bails, are turned down, when the four-horse team is started. It will be seen that the wild horses, being harnessed, are so held that they can neither injure themselves nor the persons handling them.

The stall walls used with the sweep (Fig. 6) slant upward and outward, to prevent the horse from turning and yet give him a comfortable place to stand; and the rear end of the stall is closed by a vertically sliding door held in place by cleats, while the forward end of the stall is closed by hinged doors held closed by cross bars. The ropes from the drums pass through slots made in the forward doors. When the horse is to be harnessed to one of the four arms of the sweep, the stall is connected with a chute through which he is run into the stall.

The sweep revolves about a center post supporting the center of the inclosure, and is composed of radial arms lapped past the post and bolted, and of sweep arms attached to the radial arms. The rear sweep arm of each pair is provided with a sliding bar carrying two whiffletrees, while each forward sweep arm has a bar to which the neck yokes are attached. Wheels running upon a circular track keep the sweep arms true and strengthen the sweep so that it will sustain the weight of a horse, should he attempt to throw himself. While the horse is being hitched, the sweep is locked in place. The supporting ropes pass from the stall to the arms of the sweep. The horse is first run from the chute into the stall and harnessed, and attached to the leading ropes by breast, breeching, and belly straps attached to the sliding pieces, which, in this case, are made of leather. The sweep is then locked, the bar carrying the whiffletrees is shoved back, and the ropes are attached to one of the sweep arms and drawn taut by turning the winding drum by means of the crank. The forward stall doors are then opened, and the horse is run out between the ropes to the sweep arm, when the free ends of ropes secured to the arms are passed through one of the three holes in the sliding pieces and attached to the inner whiffletree of the sliding bar, which has been shoved out. The leading ropes are then detached from the sweep. The horse being thus hitched to the sweep, a well broken horse is brought alongside of him, and attached to the outer whiffletree and neck yoke, when the braces are disconnected and the horses started together, turning the sweep. The sweep, having four arms, is adapted for training four horses at a time. The same methods may be applied to breaking saddle horses, by changing the harness slightly, and saddling the horse for the rider while attached to the sweep.

The stalls used with the apparatus shown in Fig. 8 are preferably constructed in pairs, so that two horses or cattle can be handled at the same time. The rear door is shown in Fig. 2. It is so made that it can be moved backward or forward in the stall, so that after the animal has been placed in the stall he can be shoved forward by the door and held from backing. Simple devices are provided for holding the door in any desired position. The front door is held closed by an upper and lower cross piece, so connected with a lever that they can be moved both to and from each other simultaneously and at both ends equally, so as to lock and release the doors at both the upper and lower ends at the same time. When cattle are to be handled, the head doors, instead of being slotted, have large openings made in them, through which the oxen can be forced, by the rear door, to put their heads, so that a double yoke may be placed upon them. In handling oxen neither the outer neck yoke (Fig. 8) nor the vehicle will be used, it being designed, when double stalls are used, to yoke two wild cattle with two well-broken oxen, and break them in any manner desirable.

Fig. 7 represents a structure (the roof of the inclosure being removed) for handling vicious animals to tame and train them. A common pen, leading from a large yard in which the untamed animals are herded, is connected by a gate with a smaller alley, into which the animals are run singly. The animals are directed, as desired, through chutes leading to different yards or pens. By making the stalls in connecting series, adapted to be separated by sliding gates, many animals may be handled at the same time; and by opening all the gates they can be conducted from the entrance to the box stalls, shown in the upper part of the figure; or by closing any of the gates in front and rear of the animal, he can be stopped and confined at any desired part of the circuit or series of stalls. When the animals are wild and dangerous, they are kept in the stalls and treated kindly until, by degrees, they become gentle and tame; and in order that they may be reached and kept from injuring themselves, the sides of the stalls are made slanting upward and outward. By preference, the stalls are made two feet wide at the bottom, four feet wide at the top, six feet high, and eight feet long, thus furnishing a comfortable space for the animal, and yet preventing him from turning in the stall.

Fig. 3 is a perspective view of a circular driveway, upon which the vehicles, shown in section in Fig. 5, run; Fig. 4 is a plan view of a portion of the track. Each vehicle is provided with a doubletree having four singletrees, two of the latter being within the driveway and one on each side. The driveway is composed of rails held upon posts a short distance above the ground. The rails are so formed that the vehicles can be locked upon them by sliding arms provided at their lower outer ends with anti-friction wheels. These sliding arms may be conveniently moved outward or inward, for locking or unlocking the vehicle from the rails; the arms can all be moved simultaneously. Each vehicle has a triangular platform, provided with two outer and one inner wheel. The vehicles are joined together in pairs, so that the wild horses between them will be held in a partial inclosure, formed by short leading ropes, to keep the horses from rearing upon or leaping over the track. At one side of the track is a gate for the entrance of the horses. Harnessing stalls and leading ropes, similar to those described above, are here employed. An underground passage beneath the track permits trained horses that work on the inside of the circle to pass in and out. The unbroken horses are attached to the vehicles, and a well trained horse hitched, one inside and one outside of the circle, alongside of the wild horses. A sufficient number of horses to fill the circular track may be trained at once; the vehicles are all coupled together, and when the horses are started, all travel together around the track. The wild horses are trained in this manner until thoroughly broken.

These inventions have been patented by Mr. Charles F. Shedd, of Fairfield, Clay County, Neb., who will furnish all further particulars.

To Grow Plants from Cuttings.

The old way of rooting cuttings in a small glass bottle filled with water is a good method when a hotbed cannot be used; but the bottle should not stand so close to the window as to become hot, and thus scald the rootlets. A little cotton wool within the rim of the bottle will prevent evaporation. In two or three weeks the roots will be plentiful, and then the cuttings may be transferred to thumb pots, or, if the season suits, into the beds. As each cutting is taken from the bottle, dip the roots into a little warm sand until each fiber is coated; this will keep them apart and prevent wilting. If pots are used, nearly fill them with a rich sandy compost, and press it to the sides, so as to leave room in the center. Put the roots in gently, and give the plant a little twist to spread the roots, or separate them with a hairpin. Then put in more soil, and press it about the roots. Tight pressing is one of the secrets of success in raising plants from cuttings. Water the young plants well, and shade them at first from the sun.

Cuttings can be also started in pots of sandy compost, with a glass tumbler placed over them to confine the moisture, and keep from the sun for two or three days; then place the pots in the warmest window exposed to the southeast. Wet sand is also good for growing cuttings, and they will start quicker than in compost. A shallow pan is preferable; fill it up with sand (not sea sand) sopping wet, then press in the cuttings tightly, and keep them wet. When new leaves show themselves, in two or three days transplant into pots filled with light sandy loam. After shading a day or two, they may have ample sunshine and sufficient water to keep them moist. Cuttings taken from the fresh growth of a plant strike best. It is better to break off a branch of a geranium or verbena than to cut it (if it breaks readily). Cuttings of roses, heliotrope, etc., will grow better if taken off at the junction of the old and new wood, and should be cut off just below a joint or bud, as the roots start from that point; and if a bud is not left near or close to the base, the cutting is liable to decay in the soil.

The New English Torpedo Boats.

A large sea-going torpedo boat, the first of the series of forty which the country owes to the recent popular agitation on "The State of the Navy," was lately tried in the Thames. The vessel has been built by Messrs. Yarrow & Co., of Poplar, being one of twenty that the Government has ordered of that firm. The trial was, according to present regulations, for two hours' continuous steaming at full speed, and during that time, and as nearly as possible in the middle of the two hours, six runs were made on the measured mile. A mean speed of 19¼ knots was realized, 19 knots being the guaranteed speed, with an air pressure in the stokehold of only 13¼ inches as shown by the air gauge. The boat is 125 feet long, 13 feet wide, and 8 feet deep. She has naturally far more accommodation than the first class torpedo boats hitherto constructed, being able to berth well a crew of twelve or thirteen men forward, while there is comfortable room for the officers aft. Special care has been taken to provide efficient ventilation in the new boats, and it is hoped that the great discomfort hitherto found when at sea for any lengthened period will be materially reduced. There is one tube forward for ejecting torpedoes right ahead, and arrangements are made for firing four torpedoes from either side, or two from one side and two from the other, at the option of the officer in charge. The number of torpedoes carried will be five, one in the bow gun and four in four guns for side firing. It will thus be seen that there are five torpedoes all ready to be discharged at a moment's notice. This is considered a far better arrangement than hampering the boat with a number of spare torpedoes, of which none will be carried. There will also be two machine guns, one being placed on the top of each conning tower. There are two conning towers, one forward and the other aft. Provision is made for steering the vessel from either of these towers, so that should one get damaged in action the other will be available. The four-side firing torpedo guns are fixed two to each conning tower in such a manner that they can be made to revolve so as to secure any angle of fire, which plan was originated by the authorities of the Vernon. The impulse by compressed air is to be superseded by the simpler and equally efficient system of ejecting by gunpowder. The engines are of the usual type fitted by Messrs. Yarrow in vessels of this class, the cylinders being 14½ inches and 26 inches in diameter by 16 inches stroke. The boiler is of the locomotive type, and contains the usual special features introduced by Messrs. Yarrow & Co. for torpedo boat work. The total heating surface is 1,200 square feet and the grate surface 30 square feet. The indicated horse power on trial was not accurately obtained, but is estimated at 700, the steam pressure being 123 pounds and the engines running at 376 revolutions a minute. It was noticeable that throughout the two hours' trial the speed of the engines only varied within the small limits of 1½ per cent more or less than 376. It is estimated that sufficient coal can be carried for a continuous run of 2,000 knots at a speed of ten knots an hour, the bunkers holding about twenty-three tons. Says *Engineering*: 'This most recent addition to our torpedo fleet would undoubtedly prove a very formidable antagonist at sea, being sufficiently powerful to operate in any reasonable weather. She is the result of the accumulated experience of several years, and the country is to be congratulated in having got her and her sister vessels well to the fore before they are actually wanted.

The Lowest Known Temperature.

In a former memoir (*Comptes Rendus*, xcviii., p. 365), the author describes the apparatus which enabled him to eliminate the influence of ethylene upon liquefied gases, and to obtain very low temperatures by means of oxygen and of air evaporating in a vacuum. In a subsequent series of experiments the author has further introduced into his apparatus a second tube of very thin glass, and thus isolates the liquefied gases by a double gaseous stratum. The pressure and the temperature being then considerably lowered, he has been able to solidify nitrogen, carbon monoxide, formene, and nitrogen dioxide, and to determine at the same time the temperatures of solidification. By reducing the pressure of solid nitrogen down to 0·004 meter of mercury, he has succeeded in obtaining the lowest temperature known, —225°.—*K. Olszewski.*

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Correspondence.

The Air Bladder in Fishes.

To the Editor of the Scientific American:

An answer in "Notes and Queries," August 22, may quite profitably be supplemented by a further statement of facts. That the air or swimming bladder plays some important part in the vital economy of the animals which possess is clearly shown by the extent of its development and the rich supply of blood vessels accorded to it. But it is not easy to say what that part may be, because its function is not always the same.

Perhaps the most perplexing feature is, that while the majority of fishes are provided with an air bladder, many are entirely destitute of even a trace of it. For instance, all of that great division comprising the sharks and rays have no swimming bladder, and yet the ganoid fishes, of which the gar-pikes are examples, are as uniformly supplied with it; whereas all of these are grouped together in our systems, constituting one of the great sub-classes of fish.

Among the teleosts, the sub-class which includes almost everything which we commonly know as fishes, the swimming bladders are decidedly variable. Even species of the same genus, otherwise distinguished with difficulty, are in the same state of separation. A familiar instance is the two species of mackerel, *Scomber scombrus* and *Scomber pneumatophorus*. They were for a long time held to be the old and young of the same species, yet *scombrus* has no air bladder, but *pneumatophorus* is supplied with one, taking its specific name from that fact. Evidently, therefore, it is not possible to attach any great importance to the swimming bladder, as affecting any of the functions, either vital or mechanical.

It has been said that fishes regulate their specific gravity, so as to rise or sink, by compression of the air bladder. But there is no muscular provision for such a purpose. The muscular coat to the organ is always very feeble, often so slight as to be detected only with difficulty. Its power is not great enough in any case to raise or lower the fish one-tenth part as much as a single wave of its fins; and we have seen the two mackerels, one with and one without the bladder, and yet they are of equal speed and lightness.

Undoubtedly in its development the air bladder is truly the analogue of the respiratory organs of the higher animals, corresponding quite closely to the lung. Among the ganoids it subserves a purpose in the aeration of the blood. The contained gas is secreted from the blood by its lining membrane, and is similar to our atmosphere; but in deep water fishes the oxygen greatly predominates.

In all the teleosts, however, it is considered certain that the swimming bladder has no respiratory function whatever.

In many fishes the air bladder is a closed sac; in others it has communication with the atmosphere, by an opening into the dorsal surface of the œsophagus, and in a few ganoids, into the ventral surface of the same. It is also often brought by prolongations anteriorly into relations with the auditory cavity, and thus has some bearing on the faculty of hearing.

Economically, this organ is of no small importance, for it supplies all our isinglass. Russian isinglass is prepared from the swimming bladder of various species of sturgeons, while the Brazilian comes mostly from a large catfish, the *Silurus parkerii*.

W. O. AYRES.

New Haven, Aug. 24, 1885.

Contraction of Ice.

To the Editor of the Scientific American:

In March number of your paper, page 178, is an article headed "An Icequake." The writer evidently has not pursued his subject with the eye of an Agassiz. The error is widespread as regards the expansion of ice. The writer has never seen or heard a word relative to the "*contraction*" of ice. We are taught that "water expands in freezing," more commonly that "ice expands in freezing." That is true so far as it goes; but let the cold continue and become more intense, and ice *always contracts*—the greater the cold, the more the contraction.

Who has not heard the rumbling of lakes, ponds, canals, or rivers on intensely cold nights, and seen the cause the next morning in cracks, frozen solid, more or less in width, always crossing the stream or pond at right angles to its length? Why was this? Simply the contraction of the ice under more cold. The latter term is a negative one, meaning only the absence of heat.

Many years ago the writer had occasion to cross the Bay of Quinte, an arm of Lake Ontario, which lies south of the county of Hastings, in the Province of Ontario. The previous night had been a bitter cold one, and a re-enforcement of many that had preceded it. It was in the month of March, and the ice was about 15 inches thick, and free from snow, it having been blown off the smooth surface. I noticed that as I crossed the bay diagonally near its eastern end (it is about 9 miles long and 4 miles wide in its greatest breadth), I passed over several cracks, varying from 1 inch to 18 inches. Each maintained its own width, and continued each way across the bay as far as the eye could reach. I was informed by some of the oldest inhabitants that a sudden cold snap sometimes caused the bay ice to open in a crack 3 feet wide, and some made it 4 feet. I returned a month after, during a rainstorm, and found the ice shoved up like a letter A for miles along the eastern end, in some places 6 to 10 feet high; and I must have passed along that ridge (which was near the shore in some places) at least a mile and a half before I found a spot low enough to admit of my crossing with my horse and cutter, and well do I remember how my arched ice bridge gave way under its extra load, and, as one part slid under the firm ice, came near engulfing myself, horse, and cutter.

Had the shore been sloping, the ice would have slid up on dry land, carrying stones large and small along with it.

The bay is so formed that any contraction or expansion of its ice cover must show itself at the east end, and as there is some nine miles of length to show the effect, it is quite marked. In this case the expansion must have been between ten and fifteen feet, and the thaw had only commenced.

JOHN EASTWOOD.

Tiffin, O., August 29, 1885.

Why the Dram Drinker's Nose is Red.

It is not presumed that many readers of this paper are afflicted in the manner described in the following article from the pen of Dr. J. B. Johnson, in the *Medical and Surgical Reporter*, for the latter are not of the kind likely to be interested in the subjects treated in this paper; but some subscriber may have an acquaintance who is puzzled to know why his nose has become red and lumpy, and to him the information here given may be useful if not gratifying.

It may be reasonably supposed that when the dram drinker looks upon his face in the mirror, and sees that his nose is red, he would be anxious to know the exact cause of such a condition, and why, the more alcohol he drinks, the greater becomes the redness; and also why angry-looking bumps after a while make their appearance on the end and sides of the nose? It may not be out of place to tell him, in a commonplace way, the cause; for he is but little aware, as he looks at his nose, that, as it is reddened and congested by an unnatural supply of blood, so all the respective organs of his body are kept in a state of unnatural redness and congestion by the habitual use of alcohol. If he could see his brain, stomach, liver, lungs, heart, and kidneys in his mirror, as he sees his nose, he would find each of those organs in precisely the same condition as that presented by his nose; and this congestion of the vital organs explains to him the uncomfortable manner in which their functions are performed.

When in perfect health, the functions of the organs of the body are so quietly performed that a man forgets that he has lungs and heart. In fact, his general condition is so good that he never thinks about his internal organs; but this is not so with the habitual drinker of alcoholic compounds. The alcohol which he drinks keeps his organs in the same reddened and congested condition as his nose, and he is always complaining that his head aches, or feels hot, foolish, and confused, that he does not sleep well, and has startings and jerkings of his limbs in his sleep; his appetite is capricious, his kidneys do not act well, and he has pains in his limbs and back, or his heart feels uneasy and has spells of palpitation, and his lungs do not perform their duty in a manner to make him feel at ease. He is nervous, tremulous, and easily startled; his liver is disordered, he has a bad taste in his mouth, and his tongue is coated with a thick, white fur, accompanied by feverish and thirsty sensations about his throat. When the dram drinker presents or complains of these symptoms, he may, without the slightest mistake, conclude that the alcohol has irritated his whole system, and that every organ of his body is in the same reddened and unnatural condition as that presented by his nose.

THE EXPLANATION.

The heart is a double organ, constituting within the body a force pump, the duty of which is to receive two streams of blood, and to act upon them in a manner which necessitates the duty of sending two streams of blood in different directions. It has, likewise, two sets of vessels. The duty of one set of vessels is to carry the blood *from* the heart throughout the entire body, while the duty of the other set of vessels is to carry the blood back from the entire body *to* the heart, to be sent to the lungs to meet with the air, by which it is purified. This explains how it is that the dram drinker's breath always smells of alcohol. The alcohol when taken into the stomach passes in a pure state into the blood, and when the blood, thus mixed with alcohol, is sent by the action of the heart to the lungs, the alcohol is there taken up by the air in the lungs, and breathed out on the air by the act of breathing. Sometimes the breath is so loaded with alcohol that the breath, as it escapes, will appear luminous, and can be plainly seen to be luminous when the long practiced dram drinker breathes in the dark.

HOW THE ORGANS ARE DISEASED.

The vessels which carry the blood *from* the heart throughout the body are called *arteries:* those that bring it *back* to the heart are called *veins*. The veins collect the blood from the organs and remote parts of the body as rapidly as the arteries send the blood to such organs and remote parts of the body. If the heart, therefore, sends the blood to the different organs and parts of the body more rapidly than the veins can collect it, then more work is put upon the veins than they can perform, and the result is a stagnation or congestion of the amount of blood sent in excess by the arteries for the veins to gather. Hence, as the dram drinker's heart beats about thirteen times oftener in the minute than the heart of one who does not drink alcohol, the arteries in consequence of the increased action of the heart carry the blood to the dram drinker's nose more rapidly than the veins carry it back, and the blood remains congested in the overfilled vessels, and gives the nose, face, and neck of the dram drinker an habitual redness. So stagnant is the blood thus congested in the overfilled vessels, that when the nose, face, and neck of the dram drinker suddenly meet a current of cold air, they immediately turn purple, and retain the hue until the warm air again restores them to their unhealthy redness. The blood thus stagnant in the dram drinker's nose not only causes its redness, but produces disease of the skin, and this disease of the skin causes red pimples to sprout out. In medicine, these pimples are known as *acne*, but in common language they are called *grog blossoms*, and these grog blossoms never get well so long as the continuous use of alcoholic compounds is kept up.

THE INEVITABLE RESULT.

It is a medical fact that as the influence of alcohol reddens the dram drinker's nose, and changes its appearance, so the alcohol reddens and changes the appearance of every organ of the body; and as the nose thus affected is not either in a natural or healthy condition, so every organ of his body, like his nose, is changed from a natural and healthy condition to an unnatural and diseased condition; and as the skin of the nose takes on unhealthy action, so the substance and covering of the internal organs take on diseased action, which results in a short time in the full development of incurable diseases, such as insanity of the brain, diseases of the heart, Bright's disease of the kidneys, hobnail liver, and slow inflammation of the stomach. All these diseases exist at the same time in the dram drinker; but the organ most diseased is apt to take the lead in the process of morbid action; and the other organs being also in a state of advanced disease, the law of destruction soon exerts its power, and the dram drinker passes anon from untimely disease into a premature grave.

Mechanical Uses for Natural Gas.

At many of the wells near Pittsburg, and in that vicinity, the natural gas issues with an initial pressure of 200 pounds to the square inch, or even more, and before it can be used as fuel or illuminant must have this pressure considerably reduced. Where the pipe lines are of any great length, the friction of the gas against the sides and angles is sufficient to accomplish the purpose; but where the fuel is used directly from the well, or where the transit is but short, mechanical devices become necessary. It is now proposed, however, to make use of the force thus stored up in the compressed gas, instead of wasting it as heretofore, or making provision for its dispersion. One plan suggested utilizes the pressure for blowing blast furnaces, thus dispensing with the enormous engines now employed for that purpose. Sufficient air would of course have to be introduced along with the gas to furnish the oxygen necessary for its combustion, and for so much of the solid fuel in the furnace charge as was not oxidized in the reduction of the ore, or combined in the resulting pig iron. Should this plan prove practicable, it would also lessen to a great extent the amount of solid fuel in the burden, and would be a preliminary step in the solution of the problem of a gas blast furnace.

Another proposition is to make use of the gas in working engines similar to those using compressed air. This plan appears feasible. The gas, after giving up its stored mechanical energy, would be equally available for the production of light or heat, and its entire power would be utilized. If the supply of natural gas proves at all permanent, it promises to become daily more valuable.

Mr. Andrew Carnegie, in his description of the Pittsburg field, mentions one well, in the Murraysville district, which yielded 30,000,000 cubic feet of gas in twenty-four hours. Though this is exceptional, there are many which have a daily output of half this amount, and within a radius of fifteen to twenty miles around Pittsburg there are four distinct gas-producing districts. It is quite possible, therefore, that the city might not only be supplied with a natural fuel, but lighted as well by electricity generated by the utilization of its stored mechanical energy.

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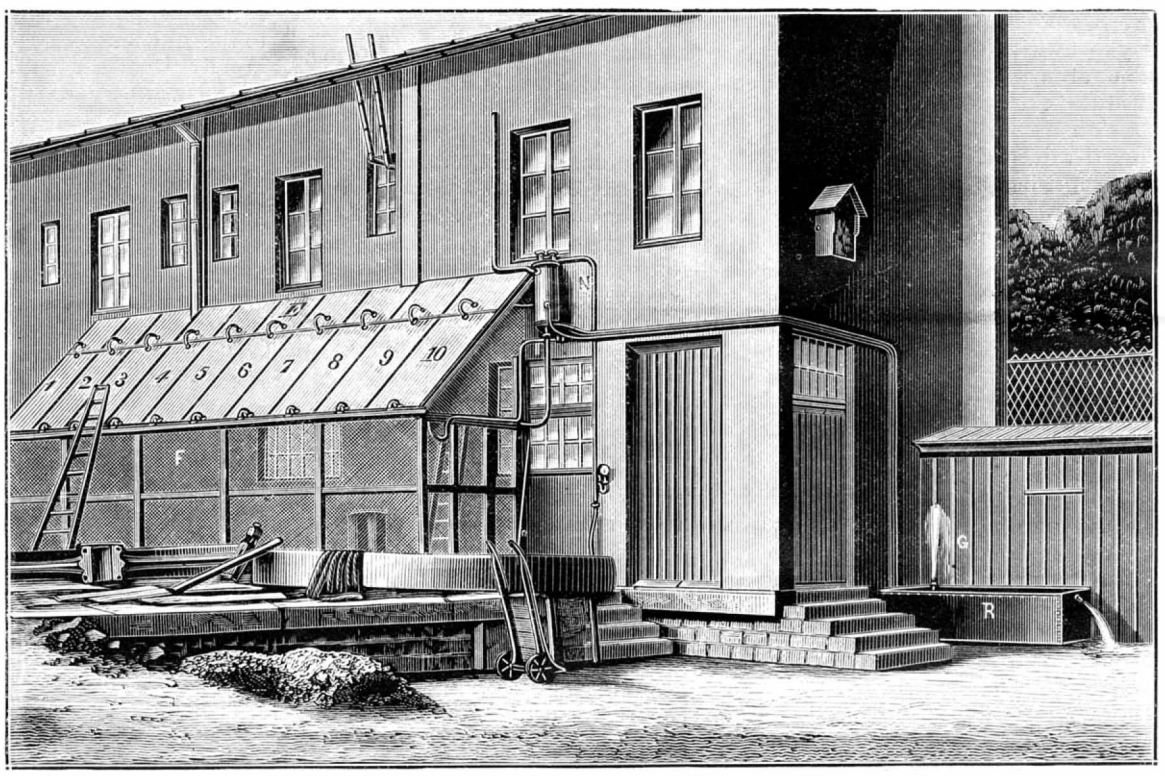
THE UTILIZATION OF SOLAR HEAT FOR THE ELEVATION OF WATER.

This article will treat of the combined application of two natural forces to the elevation of water. These forces are: first, the heat of the atmosphere; and second, the comparatively low temperature of the water to be raised.

The accompanying drawing shows the general arrangement of an apparatus worked on this principle. This apparatus has been built at Auteuil, where it operates very well, although our climate is not favorable to the operation of such a device.



THE UTILIZATION OF SOLAR HEAT FOR THE ELEVATION OF WATER.

F is a small building covered by a roof, E, which is exposed to the south, and this roof is formed of ten metallic plates, which are numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Each of these plates consists of two sheets of iron riveted together on all their edges, and separated slightly by filling pieces. Each plate thus constitutes a water-tight receptacle, in which a volatile liquid can be held. Various liquids can be used, but I prefer a solution of ammonia. Under the influence of atmospheric heat, the solution emits vapors, and said vapors or gases escape through tubes, one of which is provided for each plate and are conducted to the receptacle, N. Any liquid which may have been carried along by the gas is taken back to the plates by a tube. By another tube the gas escapes from the vessel, N. This gas has a pressure of 1, 2, or 3 atmospheres, according to the work which is to be done. It is conducted through a tube to a hollow sphere, which is placed in the well or tank from which the water is to be elevated. This sphere contains a rubber diaphragm, which can attach itself to either half of the sphere.

Let us suppose, for instance, that the sphere is full of water; the rubber diaphragm, consequently, will rest against the upper half or hemisphere. If, now, the pressure of the ammonia gas is brought to bear on the diaphragm, it will be forced to rest on the lower hemisphere; but in order to do this, the diaphragm must eject the water which fills the sphere. This causes the formation of a jet of water, as shown above the tank, R, near the letter G. But the gas must be driven from the sphere after it has been emptied of water, so that the operation may be renewed.

This is accomplished in the following manner: In the center of the diaphragm a float is inserted, which carries a rod by which a slide is actuated. One of the apertures in this slide coincides with the gas inlet and the other with the outlet. When the diaphragm rests on the upper hemisphere the inlet is opened, and the water escapes; when it moves toward the lower hemisphere the inlet is closed, the outlet is opened, the sphere is filled with water again, and so on.

This would complete the operation if the ammonia gas did not cost anything, but as it is expensive it must be used over and over indefinitely. Here we are aided by the low temperature of the water, which is made to pass through a serpentine pipe contained in a water tight vessel containing part of the ammonia solution used. The solution is cooled by the water in the pipe, and is ready to absorb ammonia. Then, as soon as the outlet is opened, the ammonia gas conducted into it is absorbed, the pressure which was exerted in the sphere is removed, and water can again enter the sphere.

A final precaution is taken, which is to attach a little pump to the float, by means of which the ammonia solution can be pumped back into the roof, E.

The apparatus at Auteuil raises over 300 gallons of water per hour. In warm countries the same apparatus would raise 792 gallons a distance of 65 feet. The calculation of the results to be obtained by this apparatus is based on the following considerations:

A sheet of metal one yard square absorbs 11 calories for a difference of one degree. Each plate which has a surface of 4 square yards absorbs 44 calories per hour. If there is a difference of 6 degrees, 264 calories will be taken from the atmosphere every hour; and by combining this quantity of heat with the cooling action of the water, it is easy, by the difference of tension produced, to obtain an inexpensive force for raising water.

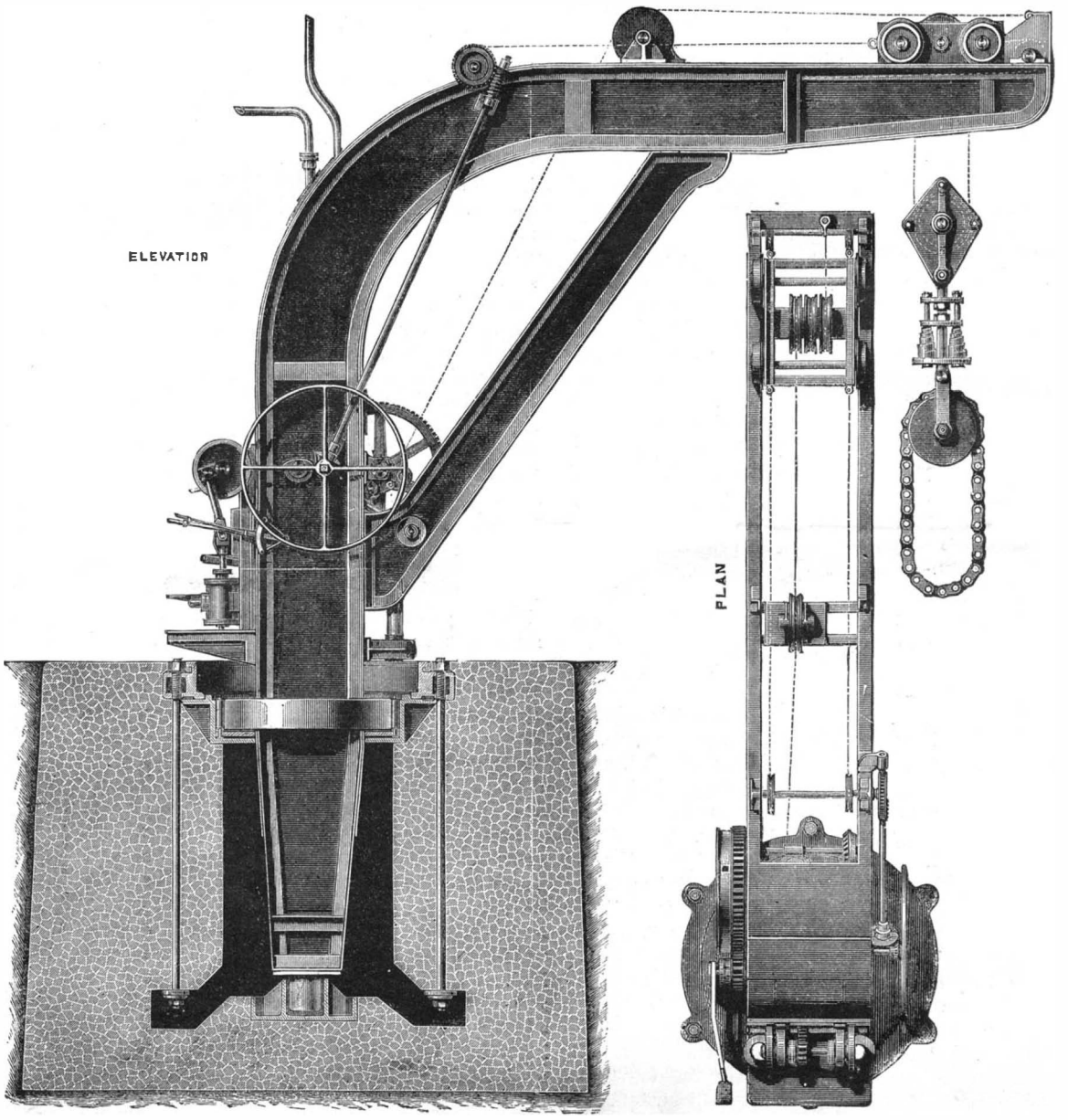
This apparatus differs from the numerous devices by which attempts have been made to utilize solar heat by means of the Archimedean mirror, by which only secondary heat is obtained. It is not necessary to concentrate the heat by metallic or other mirrors; the atmospheric heat is the basis of the operation, and all roofs exposed to the sun can be used for this purpose. In this manner a valuable motive power can be obtained in warm countries without loss of room. Generating plates, such as we have described, can be applied to any roof, and if we consider, that with only ten such plates 792 gallons can be raised 65 feet per hour, we can easily understand that a great elevating power can be obtained by increasing the number of plates.—*La Nature.*

Increased Railway Loads.

Ten years ago a standard car load on all first-class railroads was 20,000 pounds, the weight of the car being 20,500 pounds. In 1881 the load on most roads had increased to 40,000 pounds, but the weight of the car had increased to only 22,000 pounds. The master car builders of the Pennsylvania road have now adopted cars to carry 60,000 pounds, while the weight of the cars will be very little increased. Instead of hauling more than one pound of car to one pound of freight, nearly three pounds of freight can now be hauled for one pound of car. The substitution of steel for iron rails has made the change possible. This condition of affairs makes it possible for the railroads to carry freights at the low rates they receive and yet make a small profit.

FIFTEEN TON STEAM FORGE CRANES.

These cranes have been specially designed by Messrs. Abbot & Co., of Cannon Street, London, and Gateshead-on-Tyne, for the new forge of the Northeastern Marine Engineering Company at Wallsend. Two cranes are used to supply each hammer, one on either side, and work with two furnaces, so as to keep the hammer in constant work. The *Engineer* says the cylinders are 6 inches diameter, 10 inches stroke, ratio of gearing 20 to 1, and blocks 4 to 1. The extreme raike is 18 feet, and minimum raike, 12 feet. The turning is done by means of bevel wheels, and reversing clutches fixed on the second motion shaft, and the racking by means of large wrought iron hand wheel at the side.



FIFTEEN TON STEAM FORGE CRANE.

The special features about the cranes are the swan-neck jib, by means of which the top bearing, so common in forge cranes, is dispensed with, and all risk of damage to the building by the vibration from this bearing done away with; steel live rollers to reduce the friction of the center bearing, and the steel volute springs in the blocks to reduce shock of the blow. The bottom gudgeon is lined with gun metal, and has a hard gun metal disk, and the whole of the shafts have gun metal bearings.

The foundations are arranged with a subway, so as to allow a man to go down to examine and oil the bottom bearing, and the holding-down bolts have cotters, so that one could easily be replaced in case of breakage. Two 12 ton steam cranes were also supplied with the above of similar design, and also two 4 ton hand-power cranes.

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NEW APPLICATIONS OF ELECTRICITY.

Mr. Gustave Trouve has recently added two new inventions to the great number of creations of his fertile brain already perfected. We refer to two new applications of electricity which he presented to the Academy of Sciences, Monday, July 6, and which relate to the aiming and shooting of firearms at night. Their originality induces us to reproduce the note of the inventor to the Academy.

The first of these inventions consists of a luminous electric button; and the second, of a powerful projector. These devices are removable, and can be applied to any fire arms. Their operation is absolutely automatic. The Trouve electric button is of the same size as ordinary metallic buttons, and consists of a fine thread of platinum introduced into a small glass tube, which is protected by a metallic tube. A small opening is left in the metallic tube, so that the luminous button is visible only to the person using the weapon, to assist him in taking aim, but is completely hidden from the enemy or any one who is a few feet from the barrel of the gun. The device is operated by a hermetically closed pile of Mr. Trouve's. This pile, which is about as large as the little finger, can be secured on the barrel of the gun, parallel with the same, by two rubber bands. As the pile operates only when in a horizontal position, the button is illuminated as soon as gun is adjusted for firing; but when the gun is held upright, the pile ceases to operate, and the button becomes dark. It is easy to realize the great advantages offered by this device in taking aim in the dark.

NEW APPLICATIONS OF ELECTRICITY.

The luminous electric projector consists of a little incandescent lamp and parabolic reflector, or an incandescent lamp and a condensing lens inclosed in a metallic tube. The apparatus is easily secured on the barrel of a gun, parallel with the same, by two rubber bands. It is made to operate by pressing the butt of the gun against the shoulder. By means of this device the desired object can be illuminated, and all its movements followed. The generator used is the same as that used with M. Trouve's electric safety lamp, recently presented to the Academy by Mr. Jamin. It is carried in the belt, and its operation is automatic.

The services which these two apparatus are capable of rendering to the army and navy are very numerous. It is mentioned, for example, the advantages they will offer for watchmen on men-of-war in helping to fire upon torpedo boats at night, as well as in the daytime. They will also be very useful to hunters who wish to secure game at night.

Electricity and Dust.

With regard to the experiments made by Professor O. J. Lodge, it has been pointed out by a German paper that a similar experiment was described by C. F. Guitard, of London, in the *Mechanic's Magazine* for November 2, 1850. The following is an extract: "Some time since, in experimentalizing on the electric state of the atmosphere, I employed for that purpose a large glass cylinder, about 18 inches high and 9 inches diameter, open at bottom and having a neck at top. In placing the lower end of this cylinder in water, the more perfectly to exclude the air, and allowing small quantities of tobacco smoke to enter the neck at top, the smoke, after assuming various actions, according to, probably, the hygrometric state of the atmosphere, would gradually spread itself into a cloud filling the cylinder, and at length, as successive portions came in contact with the sides of the cylinder, condense. Sometimes half an hour would elapse before this effect took place. In now struck me that if I brought a wire from an electrifying machine into the neck of the cylinder, the air would immediately become charged with electricity, which would cause each portion of the smoke to fly to the sides of the cylinder, and that thus more rapid condensation would take place. The effect produced was perfectly magical. The slightest turn of a small electrifying machine produced immediate condensation. It was astonishing to see how small a quantity of electricity produced a most powerful effect. I am not aware that attention has ever been drawn to this subject; and the question will probably arise—Has electricity anything to do with the condensation of steam in the condenser?"

For a harness blacking, use boneblack, 4 ounces; linseed oil, 2 ounces; sulphuric acid, ½ ounce; treacle, 2 ounces; gum arabic, 1 ounce; vinegar, 1 pint.

A Hairless Calf.

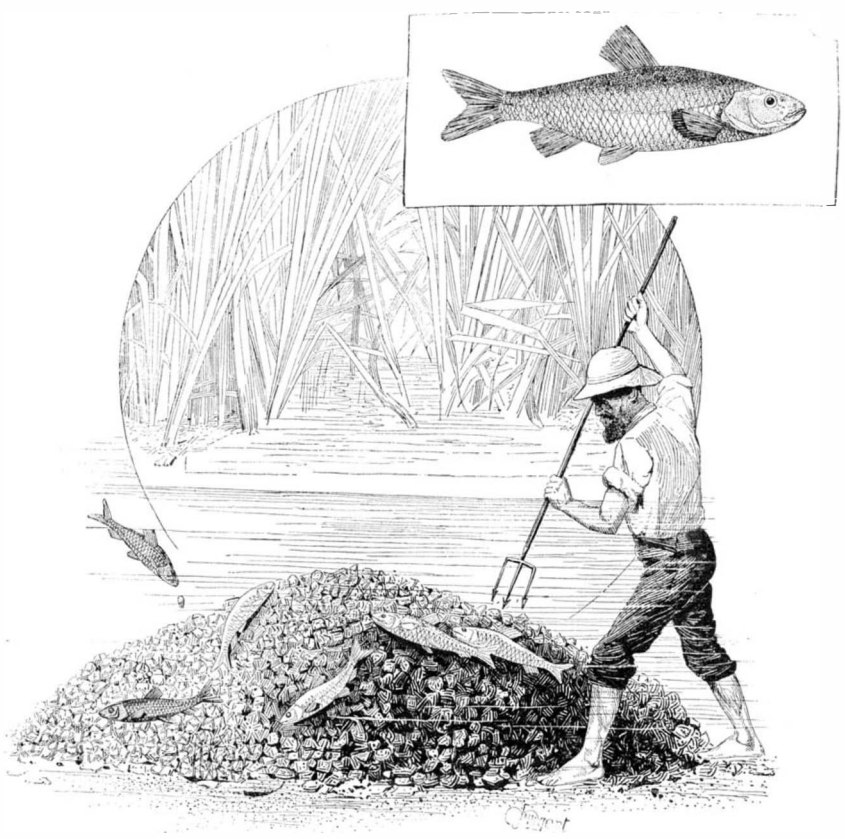
A curiosity in the shape of a perfectly hairless calf was born at Pawnee City, Nebraska, in the middle of March last. The animal, now about five months old, is well formed and apparently in perfect health, but its skin is quite destitute of hair. It is a male, weighs over two hundred pounds, and shows an appearance of horns. So far as can be learned, there is nothing in its pedigree to account for this departure from the normal type. Both of its progenitors were pure-bred short horns. Should this unique animal survive, it would be a matter of considerable scientific interest to keep track of its descendants, in order to determine whether this apparently accidental variation is capable of transmission or whether it disappears with its first possessor. The owner of the animal, Mr. J. H. Bray, has named it Young America.

CONSTRUCTIVE ABILITY OF FISHES.

BY C. F. HOLDER.

In previous numbers of the SCIENTIFIC AMERICAN the writer has shown the nest of the antennarius and paradise fish, the former being made of gulf weed wound in and out and bound together by gelatinous bands of some secretion taken from pores in the abdomen; the latter formed of bubbles of air inclosed in a mucous envelope.

In the accompanying cut is shown a nest of an entirely different character, where the material is stone, and to accumulate which much have involved a vast amount of labor and patience on the part of the finny workers. It has been my privilege during the present summer, spent on the St. Lawrence River, to examine a large number of the nests or heaps, and some of them for their great size almost challenge belief. The boatmen of the St. Lawrence know the heaps as chub beds, yet it is a curious fact that some of them differed widely in their opinions as to the makers. One man was positive that the piles were the work of the black bass (*Micropterus salmoides*), and that the stones were piled up with their tails. When asked for his reasons, he said that he had seen big bass on the heaps, and speared them there. Another man, born in sight of the nests, was positive that they were the work of muskrats (*Fiber zibethecus*), his reason being that he had speared *muskrats* swimming about the nest. I give these opinions to show how little confidence can be placed upon the opinions of unskilled observers, though, in justice to the men, it should be said that they were given in good faith.



CONSTRUCTIVE ABILITY OF FISHES.

Quite a number of men had seen muskrats around the heaps, and Mr. Andrew Clerk, of Jersey City, with whom I was fishing when these investigations were made, suggested that the muskrats were after the chub spawn; and to show that not only muskrats but field mice are fond of it, he cited the following instance, that will be of interest to naturalists:

Some years ago he owned a salmon river in the Provinces, and had unusual opportunities for many years of observing the habits of salmon and other fishes in the locality. Wishing to ascertain the natural feed of the sea trout, he directed his guide to save the stomachs of twenty or thirty. Examination of a dozen or so of these showed that in each was a field mouse (*Arvicola rutilus*, I should judge from the description, etc.), and in one stomach were two. It occurred to Mr. Clerk that the mice had been caught while diving for spawn. This opinion he expressed to a friend connected with the New Jersey State fisheries, who said that his eggs were so depleted by common mice, that would dive into the water to obtain them, that he was obliged to protect the eggs by wire screens. So it would seem that mice and muskrats are among the possible enemies of the spawn of game fishes and others.

The chub beds are found on gravelly or sandy shores on almost every island between Clayton and Alexandria Bay, and I found them in all stages of growth. One of the best localities was in the entrance to the Lake of the Islands, where, on the north shore of an island belonging to La Rue, are five or six large nests, all within a small area, and all visible from the boat at once. The largest of these was at least ten feet across the base, and, as near as I could judge, almost four feet high. The stones were all about the same size, and those that I could reach from the boat, and which brought the top of the heap to within a foot of the surface, weighed four ounces; and at the base were others that I should judge would weigh twice as much. They were of all shapes, and the entire heap looked like a load of stones that had been dumped carefully, so that it retained a somewhat regular cone-shape. Some resembled hay mows, and were flat on top; others were pointed, and I found quite a number where the work was just commenced; and, whether from design or accident I cannot say, there was a rude outline, as if the builder had a definite plan, the stones having been dropped in a semicircle before any had been placed in the center. In these new nests there were generally numbers of shells, evidently a *Unio*.

As some of the large nests were some distance from gravel beds, and the stones numbered tens of thousands, each heap weighing perhaps a ton and a half, the amount of labor done by these fishes can well be imagined, especially when it is known that the stones are brought in the mouth of the fish.

I was not fortunate in observing them at work, but it is well known how they proceed, and Mr. Clerk was fortunate in knowing a gentleman who had seen the chubs carrying stones. The largest nests were within a foot of the surface, and would undoubtedly form an obstruction to boats drawing two or three feet of water, should they run along shore. Exactly how high the chubs would build their nests it is difficult to determine, as every winter the nests are frozen in solidly, and during the breaking up in the spring are denuded of some of the stones. That the nests are renewed year after year is evident from their size, and again, the rocks on the top were usually much fresher in appearance than those below, showing that they had been recently handled. The nests are constructed for the preservation of the eggs; in other words, to protect them from the eels, bull-heads, and various fishes that affect spawn.

The breeding time is in the last of May, June, and perhaps into July, or about the same as black bass, and during this time large chubs are seen resting on the heaps. The eggs, when deposited, are washed into the crevices and interstices of the heap, and there find protection until the young appear; and they undoubtedly remain near it until they are strong enough to care for themselves. I could not find that the male remained near the nest, or exercised any care over the young. This, however, would be unnecessary, as the stone pile is quite protection enough.

The nests are undoubtedly the work of several chubs, how many, I have not been able to determine; but as fifty or more lamprey eels have been seen at work conjointly, it is not unlikely that the nests are the work

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of a colony of fishes. Quite a number of fishes are known as chubs, and several genera and species are called stone toters and rollers, from their habit of making heaps, though not as large as the above.

The chub in question is one of the *Cyprinidæ*, the *Semotilus bullaris* or *Leucosomus cataractus*, of Baird, a very attractive fish, attaining a length of twenty inches and a weight of two and sometimes three pounds. The head is distinct from the body, as regards absence of scales, and of a dark olive hue; the back brownish, with blue and sometimes green reflections. The sides, when turned to the sun, flashed a beautiful silvery tint, and the scales being large, it was, all in all, a very attractive creature. Mr. Clerk and myself frequently took them on a fly, and agreed that, so far as making a desperate fight for liberty was concerned, they were not far behind the black bass. They were also taken while trolling with a minnow bait; though this can hardly be considered their natural food, the somewhat large, fleshy lips being seemingly adapted for a vegetable diet. They are extremely common in the St. Lawrence, frequenting clear water, and abound in New England streams and as far south as Virginia, and probably have a much wider range to the west through the great lakes. In all localities they have local names, some of which are fall fish, dace, roach, horned dace, etc.

PHOTOGRAPHIC NOTES.

How to Remedy Flare or Ghost Spots in Lenses.—In an interesting paper read before the Buffalo Photographers' Convention by Mr. J. Traill Taylor, editor of the *Photographic Times*, we find the following practical directions for disposing of the flare spot frequently met with in combination lenses of the symmetrical or rectilinear type:

"Concerning flare spots," he says, "they are never seen when the lenses are used in the studio, but only when a bright sky forms part of the included subject, and only then when a very small stop or diaphragm is used.

To ascertain whether a lens has a flare spot, it should be screwed on to the camera and brought into a room lighted by a gas flame or oil light.

Go to a distance of several feet, and examine the flame on the ground glass.

The image will be sharp, bright, and inverted, now move the camera slightly, so as to cause the inverted image to be a little to one side of the center of the focusing screen, and in nine cases out of ten there will be seen a ghostly image at the opposite side of the center.

This secondary image is non-inverted, and upon rotating the camera it moves in the opposite direction to the primary image. The nature of this secondary image or ghost, and the cause of its formation, may be examined in the following way: Move the camera so that the ghost shall be near the margin, and then, placing the eye in the line of that image and the lens, withdraw the ground glass, when the posterior surface of the lens will be found to be quite luminous. That the false image is, in this case, caused by a reflection from the back surface of the anterior lens is demonstrable by unscrewing the cell containing it until it almost drops out of the tube; and then, keeping an eye upon both the primary and secondary images on the ground glass, move or slightly wriggle the front cell, which by its being nearly unscrewed may now be easily done, when it will be seen that while the primary or legitimate image of the flame remains motionless, the ghostly image caused by the reflection from the front lens dances about all over the plate.

But observe further, there is a certain distance between the front and back lenses at which this secondary image is sharp and bright, and in proportion as either the front or back lens cells is screwed in or out, so does the image become more attenuated and expanded, till at last it ceases to be seen altogether, while all this time the real image is not seen to suffer in any way. This tendency of the ghostly image to pass out of focus with such extreme rapidity, upon separating the lenses by a few turns of the screw, or by making them come nearer each other, provides the means by which this evil may be cured.

The most perfect mount for lenses of this class would be that in which the privilege was afforded the user of making an adjustment to suit work of any nature by the separation of the lenses to a very limited extent, so as to be used under the most perfect conditions for the special work in hand. With a lens of about eleven inches focus, a sliding adjustment of half an inch has been adopted with beneficial results."

Photographing the Interior of Guns.—Experiments have been made at the Royal Gun Factories, Woolwich, in order to test the application of a new electric lamp designed for making examinations and photographs of gun interiors. The system of somburizing the bores of guns by means of electricity has only been a short time in use, and has proved of great value; but the want of an electric dynamo has prevented its general adoption at many places where it would have been of considerable use, and the authorities have now taken up readily a portable battery designed by Messrs. Johnson & Phillips for the purpose of supplying the place of a dynamo in such cases. The battery, without being necessarily powerful, is chiefly serviceable on account of its constancy, as it can maintain a light of unerring brilliancy for inspections with all the leisure they may desire. The experiment was to try the battery and a dynamo in competition. Two 8 inch guns were placed side by side in the new boring mills, and photographs were taken of their interiors by both processes, the results as far as could be judged being equally satisfactory.

Rendering Paper Prints Translucent.—At a meeting of the London and Provincial Photographic Association, we take from the report published in the *British Journal of Photo.* the statement of Mr. G. H. E. Sutton, of how he makes paper prints translucent by means of burnt linseed oil. He first raised the oil to the boiling point, then taking it to an open field where there was no danger of fire, he burnt it until it reached the stage desired; this he found by testing from time to time with a knife. The oil, when well burnt, was always green and of the consistence of treacle. It was mixed with litharge, sugar of lead, and soap, and when cold was rubbed over the back of the print with a piece of rag. It dried quickly on the prints, which did not cockle. To one pint of oil was added litharge and acetate of lead each equal in bulk to the size of a walnut. In place of making the burnt linseed oil, it is suggested by the editor of the *British Journal of Photo.* that it can be purchased already made of three different consistencies, "thin," "middle," and "strong," under the title of "burnt oil," from all dealers in printing materials.

WALTER BENTLEY WOODBURY.

The well known inventor of the Woodbury process of photo-printing died suddenly from an overdose of laudanum at Margate, England, an English watering place, on the 5th ult., and was buried in Abney Park Cemetery, near the remains of other departed notables in photography.

Says the *Photo. News:* "Mr. Woodbury, who was fifty-one years of age at the time of his death, had practiced photography as a profession since he was seventeen years of age, he having then commenced work in Australia. Soon after this he established a studio in Java, and produced excellent work under very trying circumstances. Some of his views taken in Java were published by Negretti and Zambra about twenty-five years ago.

About this time he came to London, but shortly returned to Java, and established himself on a somewhat larger scale in Batavia, but soon afterward he came to London and introduced the process now so well known under the name of Woodburytype.

Since then he has been actively engaged in devising and perfecting many processes bearing on photography, and in writing in such a way as to popularize science.

Among his inventions may be especially mentioned—setting aside his very notable invention, the Woodburytype—the photo-filigrave, the Goupil method of photo-gravure, and various block processes; but he made a host of minor inventions, and since 1864 took out nearly thirty patents."

From the above brief sketch it will be seen that Mr. Woodbury largely contributed by his industry and perseverance to the successful working of many of the photo-printing processes in use at the present time, and it was in acknowledgment of the fundamental character of his invention of the Woodbury type in its relation to photography that he was awarded one of the seven gold medals issued in the Photographic Department of the recent International Inventions Exhibition, held in London.

His first patent taken out in this country was in 1866, followed by three in 1868, one in 1882, and one during the present year.

Briefly described, the Woodbury process consists in making a solution of gelatine prepared with a slight admixture of Indian ink and potassium bichromate, then spreading the same upon a leveled glass plate, letting it dry.

The film may be stripped from the plate and exposed to the light behind a negative in the usual manner, or it may be printed on the plate. An unusual length of time is required in printing, because of the comparative slow sensitiveness of the bichromated film.

Development is made by hot water, as in the carbon process. The film when dried possesses a strong relief and is exceedingly hard and tough, and when compressed against a soft metal, like lead, acts as a die, making a corresponding reverse in the same. It was the capability of the tough, hardened gelatine film to resist great pressure that Mr. Woodbury made use of. Accordingly, he devised a special hydraulic press arranged to prevent the film from spreading horizontally, but at the same time subjecting it to a contact pressure of several hundred tons upon soft type metal. The metal impression was then placed in a peculiar printing press, inked over with a compound of gelatine and India ink, and a sheet of hard pressed smooth paper laid upon it; a plate of heavy plate glass now comes down upon the back of the paper, pressing it against the metal mould, and after a pressure of two or three minutes is raised; upon lifting the paper, a beautiful impression in permanent printing ink is seen.

The ink may be varied in color, permitting a large variety of colored impressions to be made. Thousands of copies may be pulled from one metal impression, and the number obtainable from a single gelatine relief is almost incredible.

In 1880 Mr. Woodbury further improved and simplified the process by dispensing with the heavy hydraulic press and adopting instead the pressure of two rollers.

His method is as follows: A positive is made upon a glass plate instead of a negative; from this a relief mould of bichromated gelatine is produced as before, which is attached to a heavy, smooth plate of glass, so that its level character may be depended upon.

When dry, a sheet of tin foil is placed upon the gelatine mould, and, to force the thin metal securely into every crevice, mould and tin foil are sent through an ordinary rolling press. The mould with its tin foil lined surface is now removed from the glass plate and put into the Woodbury printing press, from which impressions equal in every respect to those taken from a hydraulic pressed lead relief are readily turned out.

This simple process is the subject of an American patent taken out during the present year, and, we may say, is one of Mr. Woodbury's last improvements.

We refer those of our readers who are interested in obtaining further details to the SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 213 and 243. A beautiful example of a Woodbury print may be found in the *British Journal Photographic Almanac* for 1884.

Trout Killed by Mosquitoes.

Mr. C. H. Murray, of Denver, writes to Professor Baird the following:

In the middle or latter part of June—I think it was—in 1882, I was prospecting on the headwaters of the Tumiche Creek, in the Gunnison Valley, Col. About nine o'clock in the morning I sat down in the shade of some willows that skirted a clear but shallow place in the creek. In a quiet part of the water, where their movements were readily discernible, were some fresh-hatched brook or mountain trout; and circling about over the water was a small swarm of mosquitoes. The trout were very young, still having the pellucid sac puffing out from the region of the gills, with the rest of their body almost transparent when they would swim into a portion of the water that was lighted up by direct sunshine. Every few minutes these baby trout—for what purpose I do not know, unless to get the benefit of more air—would come to the surface of the water, so that the top of their head was level with the surface of the water. When this was the case, a mosquito would alight, and immediately transfix the trout by inserting his proboscis, or bill, into the brain of the fish, which seemed incapable of escaping. The mosquito would hold his victim steady until he had extracted all the life juices; and when this was accomplished, and he flew away, the dead trout would turn over on his back and float down the stream. I was so interested in this before unheard of destruction of fish, that I watched the depredations of these mosquitoes for more than half an hour; and in that time over twenty trout were sucked dry, and their lifeless shells sent floating away with the current. It was the only occasion that I was ever witness to the fact, and I have been unable by inquiry to ascertain if others have observed a similar destruction of fish. I am sure the fish were trout, as the locality was quite near snow line, and the water very cold, and no other fish were in the stream at that altitude. From this observation, I am satisfied that great numbers of trout, and perhaps infant fish of other varieties in clear waters, must come to their death in this way; and, if the fact has not been heretofore recorded, it is important to those interested in pisciculture.

The Seal Fishery.

During the past month the steamers from provincial ports engaged in the seal fishery have been returning home, having had one of the most successful seasons ever made in that business. Full returns will be given later.

The following from the *Island Press* is of interest:

"The seal fishery has been unusually successful this year. Many steamers have returned from the sealing grounds loaded down almost to the water's edge. Steamer Ranger, with over 200 men on board, returned to St. John's with 35,600 prime young harp seals, the largest catch for her tonnage ever taken into any port in the world, every nook and corner of the ship being jammed full. She was compelled to steam slowly from the time of leaving the ice, to prevent upsetting, and had to creep home inch by inch. Fortunately the sea was calm all the way. Her deck, covered to the top of her rails with 7,100 seals, was a sight never before seen in St. John's. The companion-way was covered in, only room enough being left for a man to squeeze himself into the doorway. The lazaret contained 720, and 250 were stowed under the bunks in which the men slept. Eight puncheons were filled with oil, and the rest was stowed in the hold."

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ENGINEERING INVENTIONS.

A railway switch has been patented by Messrs. William J. Davies and William Penglase, of Stoneville, Mich. This invention combines pivot track sections, rods, levers, and swinging switch rails, to make a switch requiring neither frogs nor guard rails, to be adjusted by turn buckles placed on the rods, so the swinging sections can be firmly locked.

A railroad gate has been patented by Mr. Austin Lowe, of Minneapolis, Kan. It is made to close with weights, and has springs to receive the impact of the car or locomotive in opening, with yielding rails that sink under the weight of the cars, operating spring latches to hold the gate open until the last car has passed, when the rails rise, release the latches, and allow the gate to close.

AGRICULTURAL INVENTIONS.

A corn planter has been patented by Mr. Frank H. Rybacek, of Riverside, Iowa. It has a seed dropper operated by sliding clips, worked by levers having daggers which enter the ground and thus move the clips, whereby the seed dropper is operated independent of the wheels.

A corn shocker has been patented by Mr. Edward W. Comegys, of Edesville, Md. The body of the machine is mounted on truck wheels, and it is provided with appliances to gather corn and stalks on the field, either at the time of cutting or afterward, to hold the corn while being tied in bundles, to carry the bundle to the shock, and to stand it up against the shock.

MISCELLANEOUS INVENTIONS.

A stump puller has been patented by Mr. James L. Martin, of Decker's Point, Pa. Combined with a supporting frame are hooks, levers, and grips, put together in a special way to give great power for extracting stumps, elevating rocks, and similar uses.

A pump has been patented by Mr. Lawrence A. Kelly, of Dayton, Washington Ter. It is double acting, and the discharge pipe forms the piston rod, receiving a reciprocating movement from a double rack driven by the rotation of a semi-cogless pinion, with guide plates for keeping the rack in position.

A coffin has been patented by Mr. John C. Meyer, of New York city. The box and lid are provided with an exterior coating of plastic material, on the outer surface of which ornaments are produced in relief, the object being to produce a casket that is elegant in appearance and durable at a moderate cost.

A combined belt buckle and cup has been patented by Mr. Walter R. Johnston, of Sherbrooke, Quebec, Canada. The combination also embraces a removable interior box adapted for holding various tools or implements so they may be conveniently carried on the belt.

A log turner has been patented by Mr. Joshua Evered, of Duluth, Minn. It has a pivoted cylinder divided into two compartments, with a piston in each, a valve in the journal, and a toothed log rolling bar connected with the upper piston, making a steam actuated machine for rolling logs.

A rock drill has been patented by Mr. Andrew McConnell, of Pittsburg, Pa. Its special feature consists in a mechanical movement by which the reciprocation of the drill rod is accomplished in a very simple manner, the drill being adapted to be operated by hand by prospectors, or by power for general uses.

A gang plow has been patented by Mr. Henry W. Wynne, of Dominion City, Manitoba, Canada. This invention covers a special construction whereby a gang of plows may be made complete in itself suitable to be attached to and carried by any pair of wagon or cart wheels, with means for raising and lowering the gang, and for canting the plows from side to side.

A wardrobe bedstead has been patented by Mr. Robert Mitchell, of Atlanta, Ga. It is made with the head board of the bed hinged to the wardrobe, and in two sections hinged to each other, with a mosquito canopy adapted to fold down on the bed and into the wardrobe, so the whole may be quickly and easily folded into the wardrobe.

A weight cord and attachment for windows has been patented by Mr. Edward T. Bradbury, of Mahanoy City, Pa. The block is of a size to be inclosed by a cavity in the sash, and is so made that in case the cord requires to be shortened, this may be easily and quickly effected without interfering with the raising or lowering of the window.

A pumping machine for stone saws has been patented by Mr. Fred R. Patch, of Proctor, Vt. This invention provides a pump and distributing apparatus for supplying a mixture of sand and water for stone saws, and regulating the same according as the stone stands high or low in the gang, without undue waste or spattering.

An adjustable plaque stand has been patented by Mr. Emile Blaesius, of New York city. It has curved and hook legs, in one piece, with a crosspiece and vertically adjusting rear leg held in an opening made in the crosspiece, making an adjustable support for pictures, to hold them at the proper angle or pitch to show to the best advantage in any light.

A pneumatic tool has been patented by Mr. James S. McCoy, of Brooklyn, N. Y. The invention consists principally in forming the lower end of the striker with air passages or recesses to facilitate the exhaust of the air, so that the striker in its downward movement will not be unevenly resisted by the air in the piston chamber.

A pruning shears has been patented by Mr. Isaac M. McKay, of Pomona, Cal. A pair of levers have an arm extending beyond the pivot joint, with blades attached to the levers and arms in such manner that the blades draw in opposite directions when they close, to shear cut more effectually than other shear cutting shears.

A paper mould for casting stereotype plates has been patented by Mr. Louis H. Allen, of New York city. The mould is formed by using side bars of a less thickness than the height of the type to receive the side parts of the matrix paper, and placing thin side bars over these parts, to make moulds with square shoulders for producing stereotype plates with finished sides.

A means for operating doors and shutters has been patented by Mr. Eliab Perkins, of St. Joseph, Mo. By this invention doors and shutters are so hung as to slide or roll, and for their separate movements racks and pinions are suitably arranged, combined therewith being a windlass with ropes connecting as may be desired, so that all may be moved together.

A lubricating composition has been patented by Mr. Albert A. Martinez, of New Orleans, La. It is made of Central American scrap rubber or caoutchouc, ground alum, plumbago, and rosin soap, with crude or refined black oil, rock oil, or coal oil, combined and mixed in certain proportions and after a specified manner, so that it will resist a very high degree of heat.

A combination tool has been patented by Mr. William B. Kennedy, of Silver Reef, Utah Ter. The invention consists of a boring tool stem, to which are attached by hinges a series of different tools, the interior of the stem having also a spring socket to receive the tools, and the exterior of the stem having spring holders to hold the tools.

A washtub has been patented by Mr. George W. Crouse, of Lexington, N. C. It is so arranged that the washer, consisting of a pair of rolls, may be shifted higher or lower in the tub, while there are lids at each end to prepare the clothes for washing and receiving them afterward, with various other novel features.

A tag and tag fastener has been patented by Mr. Ovid W. Conner, of Wabash, Ind. It consists in a combination of a card or ticket, a self-engaging hook, preferably a double one, either barbed or plain, for attachment of the tag to goods, and a cord or like flexible connection directly connecting the hook with the card or ticket.

A washboard has been patented by Mr. Henry C. Carter, of Montclair, N. J. Combined with the frame of the washboard, having sockets or holes, is a removable and reversible protector, constructed to also form the upper cross beam or guard of the board, and having pins or tenons adapted to fit the sockets or holes.

A railway cable bridge system has been patented by Mr. John G. Ogden, of Chicago, Ill. By this invention a continuously running cable may pass over a bridge draw, whether it be open or closed, and while it is being opened or closed, continuing along the route from both ends of the draw, so that cars with cable gripping devices may be moved to and over the draw by the cable.

A hook buckle has been patented by Mr. Victor Berthelot, of Cannon Store, La. The buckle frame has notch forming stops on one side, with a bar hinged to the opposite side of the frame with a leg to enter the notch, a locking device on the frame being adapted to engage the hinged bar, the buckle being cheap and practical and easy to shift upon strap or canvas.

An apparatus for the manufacture of illuminating gas has been patented by Mr. Frederic Egner, of St. Louis, Mo. The method of making water gas by this invention differs from former processes, in that, instead of alternately heating the fuel and then supplying steam to be decomposed, the steam and air go into the same furnace together, bituminous coal and coke mixed being preferred to work with.

A pole or shaft for vehicles has been patented by Mr. Theophile Lauzon, of Long Island City, N. Y. This invention relates to coupe stay couplings for drawbars and shafts with stationary and hinged plates having pin sockets and rabbeted ends, and the construction is such that the shafts and drawbars can be readily attached to the stays and detached therefrom.

An electric organ action has been patented by Mr. George G. Wacker, of New York city. Combined with a pneumatic valve is an electromagnet having two separate air channels connected with the wind chest and pneumatic lever, with a ball valve held below the bottom of the tubular core of the magnet to reduce friction, avoid binding parts, and dispense with springs.

A machine for doubling and twisting silk and other threads has been patented by Mr. Joseph E. Tynan, of Paterson, N. J. It has certain novel features in the feeding and stop mechanism, and in the construction and arrangement of the spindles, to facilitate the manufacture of "tram" and all varieties of twist, in which the threads are fed from the spools or bobbins, doubled, and then twisted or spun. The same inventor has also obtained a patent for a machine for throwing silk, covering a mechanism for revolving the spindles and to arrest their movement in case the thread breaks, in which single threads are twisted, doubled, and respun by a continuous operation.

An automatic stop valve for gas and oil pipes has been patented by Messrs. William F. Cosgrove and Ernest F. Jennings, of Jersey City, N. J. It is made with a hollow plug having a central stem and a spiral spring resting against the screw cap of the plug to cause it to drop with certainty when released, the couplings being designed to be connected with pipes so that should a fire occur the pipes will be automatically closed, and prevent the escape of oil or gas.

A tricycle has been patented by Messrs. Tomas P. and James B. Hall, of Toronto, Ont., Canada. Combined with a reach or tube are driving wheels and levers for operating them, foot boards on the levers, racks on the foot boards, and pinions on the shaft, there being an upright steering tube on the reach connected with the steering wheel, the design being to construct a vehicle which can be operated, steered, and controlled very easily.

A slitter shaft for paper cutting machines has been patented by Mr. H. Bridgman, of Pittsfield, Mass. Combined with a hollow shaft are cutter disks and a tubular screw adapted to act on one of the disks, a screw spindle passing through the tubular screw adapted to act on the other cutter disk, with hand wheels on the ends of the spindle and the tubular screw, with other novel features to adapt a machine to cutting paper into strips.

A well cover has been patented by Messrs. Henry P. Bullock and Henry B. Cook, of Jonesborough, Texas. Combined with a sliding cover are pivoted levers united by a step and connected by a bar with the cover, there being also connected therewith a trough or spout, the whole so arranged that the cover can be moved back by stepping on a step in front of it, and moves back to automatically close the well when the pressure is removed.

A process of making plates or masses of carbon has been patented by Messrs. Samuel J. Coxeter and Heinrich Nehmer, of 23 Grafton St., East, Middlesex County, Eng. The carbon is first mixed with an alkaline silicate to form a pasty mass, which is dried and immersed in a solution to remove the alkaline silicate and precipitate the silica intimately among the carbon, then the composition is boiled in water and dried, making what is termed silico-carbon.

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Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 46.

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Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Emerson's ☞ Book of Saws free. Reduced prices for 1885. 50,000 Sawyers and Lumbermen. Address Emerson, Smith & Co., Limited, Beaver Falls, Pa.

Hoisting Engines, Friction Clutch Pulleys, Cut-off Couplings. D. Frisbie & Co., Philadelphia, Pa.

"How to Keep Boilers Clean." Send your address for free 88 page book. Jas. C. Hotchkiss, 86 John St., N. Y.

Barrel, Keg, Hogshead, Stave Mach'y. See adv. p. 76.

The "Improved Green Engine," Automatic Cut off. Providence Steam Engine Co., R. I., *Sole Builders.*

Catechism of the Locomotive, 625 pages, 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N. Y.

Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Patent Elevators with Automatic Hatch Covers. Circular free. Tubbs & Humphreys, Cohoes, N. Y.

Brands cut in Wood, Pattern and Brand Letters. Vanderburgh, Wells & Co., 110 Fulton St., New York.

Brass and Iron Working Machinery, Die Sinkers, and Screw Machines. Warner & Swasey, Cleveland, O.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

NEW BOOKS AND PUBLICATIONS.

BALLOONING; ITS HISTORY AND PRINCIPLES. By G. May. New York: D. Van Nostrand.

With the many experiments now being constantly made to adapt electricity to new uses, probably its possible application to aerial navigation has been most often talked about. This fact has drawn no small share of public attention to what has been done in the past in the way of ballooning, the interest in which it is the design of this brief treatise to satisfy. The results of past work in this field are concisely set forth, and the problems of aerial navigation are brought down to the most recent experiments of French and German investigators.

PRINCIPLES OF ECONOMY IN THE DESIGN OF METALLIC BRIDGES. By Charles B. Bender. New York: John Wiley & Sons.

This is a work designed to assist those who have to make projects of great bridges, treating of the theoretical quantities and comparing some of the more important types of bridges in this regard. The author's facts and reasoning go far toward making an absolute demonstration of the statement that those types of bridges having a theoretical minimum quantity of material are in reality the best and most useful ones, but the importance of properly computing the actual strength of the iron or steel used, as well as the strains, is carefully pointed out. The book puts nearly all questions in the form of mathematical formulæ, but they are for the most part of an elementary nature for all who have had any experience as engineers in bridge building.

MOISTURE AND DRYNESS; OR, THE ANALYSIS OF ATMOSPHERIC HUMIDITIES IN THE UNITED STATES. By Charles Denison, A.M., M.D. Chicago: Rand, McNally & Co., 1885.

In this reprint of a paper read before the American Climatological Association, Dr. Denison urges the claims of coldness, variability, and stimulation, as against their opposites, warmth, equability, and enervation, in the climatic treatment of phthisis. Instead of taking as a standard of comparison the relative humidity of the atmosphere, he refers all climates to the absolute humidity, or the weight of aqueous vapor in a given volume of air, irrespective of temperature or other local or variable conditions. This furnishes undoubtedly a truer standard, since the point of saturation of the atmosphere varies so widely with the temperature; but the hygienic conclusions from such an evaluation must be drawn cautiously to be in accordance with medical experience. Two sets of maps are given, showing respectively the average cloudiness and the absolute humidity of the air over the entire United States during the four seasons of the year. By this method of analysis, Dr. Denison reaches the conclusion that the great natural sanitarium for the consumptive is found on the high desiccated plateaus of the far West. The clear atmosphere, the warm sunshine, and the increased respiration caused by greater altitude give, in his opinion, the best possible conditions for the cure of pulmonary complaints. Many who have still a good word to say for the South will yet be interested in the comparison instituted, though they may not agree entirely with the conclusions.

GAS ENGINES. By William Macgregor. New York: D. Van Nostrand.

This book discusses the principles and gives very full details of the lines of experimenting on which the gas engine has been brought to its present stage of development. The rapidity with which the gas engine has come into general use within the past ten years, a fact that is even more noticeable in England than here, has caused much attention to be given to its improvement, and the consideration here given to the various methods of using gas as a motive power covers nearly all that has been done abroad in this line up to the present time.

Received.

METEOROLOGICAL OBSERVATIONS AT THE ADELAIDE OBSERVATORY, (AUSTRALIA.) FOR 1882. By Charles Todd. Adelaide: E. Spiller.

JOURNAL AND PROCEEDINGS OF THE ROYAL SOCIETY OF NEW SOUTH WALES FOR 1884. Vol. XVIII. Edited by A. Liveridge. Sydney: Thomas Richards,

THE CANADIAN TEXTILE DIRECTORY, 1885. Montreal: E. B. Biggar.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Information requests on matters of personal rather than general interest, and requests for **Prompt Answers by Letter,** should be accompanied with remittance of $1 to $5, according to the subject, as we cannot be expected to perform such service without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Minerals sent for examination should be distinctly marked or labeled.

(1) C. W., Jr., asks: 1. What kind of clay is used in clay modeling, and where could it be obtained? A. The clay used for this purpose is specially prepared, and can be obtained from dealers in artists' materials. 2. How are those papier mache ornaments made? That is, what is the process they go through? A. The substance of the paper, *i. e.*, the paper pulp, is suitably mixed and then pressed into moulds. The articles are then varnished or polished. See Spon's Workshop Receipts, 1st series, under title "Papier Mache." 3. What would be the price of a pair of homing pigeons, used for breeding purposes only? A. About $1.50 per pair. 4. In taking tintypes, do you have to develop them immediately after exposing them in the camera, or could you wait for some time? How long could you wait? A. The developing must be done immediately.

(2) C. W. G. asks the best receipt for toothache and neuralgia. A. Cocaine hydrochloride as a local anæsthetic is frequently used for the complaints mentioned; its effect is of course but temporary.

(3) W. T. asks: Can you give me the process of oxidizing silver? A. Add four or five thousandths of ammonium sulphide or potassium sulphide to water, at a temperature of 160° to 180° Fah. When the articles are dipped into this solution, an iridescent coating of silver sulphide is produced, which after a few seconds turns blue black if allowed to remain in the liquid. Remove, rinse, scratch brush, and burnish when desired.

(4) S. A. C. asks (1) how the liquid preparation for silver plating that is sold by street men is made, and if it has any value for the purpose of plating small articles? A. Dissolve 1 ounce crystals of silver nitrate in 12 ounces soft water. Then dissolve in the water 2 ounces potassium cyanide. Shake the whole together, and let it stand until it becomes clear. Have ready some half ounce vials, and fill them half full of Paris white or fine whiting, and then fill up the bottles with the liquid, and it is ready for use. The silver coating is not as tenacious to the article as when electrolytically deposited.

(5) J. L. M. asks what the wheel is made of, and how made, that turns up the iron rollers true, or the new iron flouring mills. A. The rollers are turned in a lathe to the desired size, and then planed in their centers in a planing machine that has a device for turning the roller as much as required for the spiral groove, while the planing tool cuts lengthwise of the roller. The turning device has a division feed motion to equalize the grooves. For chilled rollers an emery wheel is used for the cutter, the other device being the same as for ordinary rollers.

(6) J. E. M. asks for a good quick-hardening cement for screwing wrought iron pipes together for ammonia gas. A. Rubber cement mixed with boiled linseed oil and plumbago. Rub the linseed oil and plumbago into a paste, and then mix the rubber cement, about equal parts. Thin, if required, with a little benzine.

(7) J. G. M.—The classification of the magnitudes of stars is not definite, but rather arbitrary, as there are no two stars, especially of the larger magnitudes, that are exactly alike. There are assigned by astronomers about 14 of the brightest stars to the 1st magnitude, 48 to the 2d magnitude, 152 to the 3d magnitude, etc.; all of which vary greatly in brightness within the limit of their grades. A problematic planet beyond Neptune is receiving attention from astronomers.

(8) C. W. C.—We cannot give the percentage of gain of composition tubes over iron. It is very small and subject to great variation by the condition of cleanliness. They are very little used in stationary boilers. They are more liable to leak than iron tubes. We cannot recommend them.

(9) C. M. asks a rule for ascertaining diameter of any shaft required to transmit a given horse power, revolutions being known. A. Diameter of shafts for transmitting a given horse power. For prime movers:

$$\sqrt[3]{\frac{100\times\text{H. P.}}{\text{Revolutions}}}=\text{diameter in inches.}$$

For secondary or transmitters:

$$\sqrt[3]{\frac{50\times\text{H. P.}}{\text{Revolutions}}}=\text{diameter in inches.}$$

(10) M T. asks: 1. If I exhaust the air from a cylinder with an air tight piston, thereby creating a vacuum, and then release the piston so that it flies back by means of atmospheric pressure, will it strike with greater force in proportion to the distance it falls, as in case of falling bodies under influence of gravity? A. Yes. 2. If so, how shall I calculate the force of the blow? A. Multiply the weight in pounds by the velocity in feet per second, which will give the momentum in foot pounds. You cannot make use of gravity in the computation of the fall of the piston, as a vacuum acts as a force which accelerates the fall by gravitation.

(11) J. H.—Canceled postage stamps are valueless, except in limited quantities to dealers in postage stamps for collections.

(12) T. J. W. asks how egg shells are engraved upon. A. The eggs are first dyed any suitable color, and then the desired figures are produced by an etching needle or any sharp pointed instrument producing the design in white on a colored background.

(13) H. S. H. desires (1) a recipe for the mucilage which is used on postage stamps. A. Take of:

Gum dextrine	2 parts.
Acetic acid	1 "
Water	5 "

Dissolve in a water bath and add alcohol 1 part. 2. Is there any way to keep a rifle barrel from rusting on the inside? A. After using, clean with benzine, then coat with a little armor oil, just sufficient to form a thin film on the barrel.

(14) M. E. R. asks how to get rid of nests of black ants. A. Boil four ounces quassia chips in 1 gallon water, for 10 minutes, and add 4 ounces soft soap. This is said to be excellent for the destruction of black ants. Pulverized borax sprinkled over places infested by these vermin is said to disperse them. A few leaves of green wormwood, scattered among the haunts of these troublesome insects, is recommended as effectual in dislodging them.

(15) J. H. asks how to put a bright gloss on pearl, such as knife handles and other mother of pearl articles. A. Go over it with pumice stone finely powdered, washed to separate the impurities and dirt, with which polish very smooth; then apply putty powder and water by a rubber, which will produce a fine gloss and good color. We understand that Vienna lime is likewise used, but the finish is produced by experienced skill rather than any special ingredients.

(16) C. A. B. desires a good recipe for cement for cementing glass to wood. The wood has an oil finish. The cement is expected to stand the weather. A. Melt resin and stir in calcined plaster until reduced to a paste, to which add boiled oil, a sufficient quantity to bring it to the consistence of honey; apply warm. Or, dissolve glue in boiling water to the consistence of cabinet maker's glue, then stir in sufficient wood ashes to produce a varnish-like mixture. While hot, the surfaces to be united must be covered with this compound and pressed together.

(17) E. H. writes: The granite base to our soldiers' monument is badly stained by the coloring matter from black cambric cloth which was used as drapery on the occasion of General Grant's death? Is there anything known which will remove the stain readily? A. We would recommend you to try the following: Mix one part by weight of American pearl ash with three parts quickstone lime, by slaking the lime in water and then adding the pearl ash, making the mixture of about the consistence of paint. Lay the above over the whole of the work required to be cleaned, let it remain 14 to 16 hours, when the coloring can easily be scaped off. Either of the caustic alkalies might be found to act very satisfactorily. Their efficiency would be increased by using them hot.

(18) J. H. F. asks: 1. What will take match stains out of marble? A. Spots from sulphur and phosphorus caused by lucifer matches can be extracted from marble by carbon disulphide; or take 2 parts of common soda, 1 part of pumicestone and 1 part of finely powdered chalk; sift it through a fine sieve and mix it with water; then rub it well all over the marble and the stains will be removed, then wash the marble over with soap and water, and it will be as clean as it was at first. 2. Recipe for making the so-called gloss paint (white paint having a smooth and glossy surface). A. This paint consists of French zinc oxide ground in dammar varnish.

(19) C. F. S. asks (1) the composition of a liquid for mixing bronze, one that will dry quickly and leave the work bright. A. The so-called gold liquid, which can readily be purchased from dealers in paints, etc., consists of wax dissolved in benzine or of a mixture of japan in turpentine. Both are used. 2. Also the process of applying smalt to signs to give them the sanded appearance? A. Any desirable pigment of proper color is mixed with boiled oil, applied to the surface, and before it dries completely the smalt is sanded on by means of a pepperbox-like vessel. 3. What is used by manufacturers of ready mixed paints to give the fine gloss which most of them possess? A. Various varnishes are used.

(20) J. G.—The word "pitch" has many applications, and is not only used to denote the distance between threads of screws and teeth of wheels, but also the distance a screw travels without regard to its relations with any other thread, and in this sense is applied to screw propellers, the measure of which is counted along the axis of the screw. The designation of multiple thread screws should be, in all cases, exactly specified, as ⅛ inch pitch double or triple, or, as in machine shop phrase, 8 thread single, double or triple thread. In your case the master was right.

(21) W. A. H. asks what the red material is that is put on the electro-magnets of large machines, and what its use is. A. It is shellac varnish colored with vermilion. The varnish is applied to improve the insulation; the vermilion is simply to impart color.

(22) W. A. P. asks: I am making the dynamo described in SUPPLEMENT, No. 161, and I would like to know what difference it would make if I should wind the electro-magnet with No. 19 wire instead of No. 16? What number wire should I use on the armature, if No. 19 was put on the magnets. A. The finer wire would increase the resistance of the magnet, so that the current generated by the armature must necessarily have a higher electromotive force. To secure this, the armature should be wound with finer wire, say No. 20 or 22.

(23) Electro writes: I am engaged in dark electro bronzing. I want to give it a green background, something that will not wash out and will not turn with heat. The articles that I speak of are grate fronts, the designs are deeply engraved, the raised part to be left bronzed, background green, so as to have two colors. A. It is difficult to suggest anything that will fulfill all the conditions. Try a paint composed of fine green smalt and water glass.

(24) J. L. asks: 1. I should like to know if the electro-magnet described in SUPPLEMENT, No. 161, should be soft or common cast iron? A. Soft cast iron is preferable. 2. What sort of iron should the armature be cast from? A. Soft gray iron. 3. If a machine of this kind would be good for electroplating; if not, for what reason? A. Yes, if wound with coarser wire, say Nos. 12 and 14 instead of 16 and 18. 4. What is vulcanite, or how could I find out how it is made? If I cannot get it, what is the next best thing to use? A. Vulcanite is hard rubber. It can be purchased from any dealer in electrical supplies. Hard wood will answer the purpose.

(25) W. A. P. writes: I am making the dynamo described in SUPPLEMENT, No. 161, and would like to know how many feet of wire I will need for magnets and for armature? A. For the magnet, about 500 feet; for the armature, about 40 feet. 2. Could such a dynamo be driven by a weight and a clock movement? If so, how would it be best to regulate the speed? A. It could be driven in that way, but it would be impracticable. The weight would have to be large, and would require frequent winding. A governor, such as is used on a chronograph, would regulate the speed.

(26) F. A. R. asks how an electric wind dial can be constructed to show the direction of the wind, and placed in an office for instance. A. It can be done by providing a circular row of contacts to be touched by an arm carried by the vane. The contacts will be connected each with one of a circular row of electro-magnets arranged to act on an armature carried by the spindle of the index in the office. The remaining terminals of the magnets are connected by a wire with one pole of a suitable battery, the other pole of the battery being electrically connected with the spindle of the vane. It would be better, if the arrangement of your office will permit, to extend the spindle of the vane to your office, and apply the index to that.

(27) W. A. M. writes: 1. Some time ago I bought of a New York optician a crown glass object glass, for a telescope, 8 inches in diameter, and of 72 inches focus. I had a metal tube made and squared at both ends, and the object glass I had mounted, and bought me an eye piece of the same firm that made the object glass. After setting up the telescope, I failed to get any view. It (in looking at the moon) seemed blurred, and I could not make out anything. What is the trouble. Where have I gone wrong? I thought the trouble was in the length of focus, but I have tried every way. Help me if you can, as I do not want to give it up, after going this far. A. Although you should get an image with your object glass, you should not expect first class results from a non-achromatic objective. The eye piece should be of rather low power, and you would probably gain considerably in definition by reducing the aperture. Possibly you may have omitted to blacken the inner surface of your tube; any reflection from the inner surface of the tube would impair the efficiency of the instrument. 2. What is the best exterminator for cockroaches? A. Persian insect powder blown into the crevices around the range and sink, if persisted in, will exterminate them. Phosphoric paste is also efficient. They may be trapped in an ordinary cuspidor, by placing some molasses in it, and providing some sort of an approach by which they can climb to the top. They readily get in, but cannot escape, as they are unable to walk over the smooth inclined surface of the cuspidor. 3. The keys of my piano have all turned brown. What can I use to make them bright again? A. Rub them down with fine pumicestone and water, then apply a thin paste of chloride of lime, finally exposing the keys to the sunlight for several days or weeks.

(28) W. H. writes: 1. I have a small electro-magnetic battery; its cell is composed of a carbon cup an inch and a half diameter by three-quarters of an inch high, and about one-eighth inch in thickness, inside of which is a cast zinc ring one inch diameter by seven-sixteenths inch high, and one-eighth of an inch thick. Fluid used is bisulphate of mercury and water. This makes a very fair sort of a current, that lasts half an hour or so, but is not as strong as I would like. Would a Leclanche battery connected by wires to the proper posts give a more powerful current, and how long should or could it be run at a time? If the Leclanche would not do, is there any form of cheap battery that would? A The Leclanche battery is not adapted to continued use. Three or four cells of some constant battery, the gravity or Daniell, for example, would answer better. You could, if desirable, place such a battery in your cellar. 2. Would zincs, such as are used in the Leclanche, do for the battery mentioned in the SCIENTIFIC AMERICAN of April 11, 1885, page 230? A. Yes, but plates an inch or so wide would be better. 3. How many of these batteries would it take to run a ten candle power incandescent light? A. It depends altogether on the resistance of the lamp—25 to 40 cells. The battery referred to would be useful for experiments only in electric lighting. 4. Are there any railroads that run into New York that take young men to learn to fire, as it is called? I have tried a long while to get a place on the New York, New Haven, and Hartford, but without success. A. We have not this information at hand. Better write the officers of some of the roads.

(29) W. B. R. writes: Would you please inform me how to make a gas bag for oxygen, for calcium light purpose? Could I make it like an ordinary bellows of leather or rubber, and tacked around the board as the large bellows are? Also, what would be a good cement to bind the seams together? I would like it to hold about 35 or 40 gallons, and what size would I have to make it? A. We would not advise the use of board sides for your gas bag. Better use rubber cloth throughout. Make the bag wedge-shape, about 10 inches thick at the thicker end and 2½ by 3 feet square. Cement the sides and top and bottom together with rubber cement, such as may be purchased at any rubber store. You can make the cement by dissolving pure rubber in bisulphide of carbon or in naphtha. You will probably find it both cheaper and better to purchase a bag suited to your purpose.

(30) A. E. C. asks (1) how to make a small sized, high tensioned, and constant battery, one that the elements will not have to be removed from fluid when current is broken. The above must be a one cell affair, to be used to light a ½ or ¼ power incandescent lamp. A. One cell of battery is insufficient to produce an electric light of any value. By means of a chloride of silver cell, or a Grove or Bunsen, you would be able to render a short piece of fine platinum wire incandescent, but it would yield very little light. 2. How are decalcomanie or transfer pictures made? A. They are printed on paper heavily coated with a soluble sizing. 3. What is the meaning of the character after these figures, $3^{\cdot}21 \pm$? A. It indicates that the number to which it is affixed may have either of the signs + or —. It signifies ambiguity. 4. What is the Japanese shaku? A. Probably you mention a local name for something we do not know by that designation. 5. Who is right in the following argument? B and I were arguing upon the origin of cobwebs. B contended that they were the work of spiders, and I that they were not, as it is seldom one will see a spider in or about them. A. B is right. 6. How to make a vest pocket size battery for scarf pin lamps, one that the elements do not have to be removed when current is shut off? A. Consult back numbers of the SUPPLEMENT. 7. Can one obtain a patent for an electric bell, lamp, or anything, whatsoever it is, and invent a new use for same? Could I obtain a patent upon that new use? A. If by the new application a new and important result is secured, it is possible in many cases to secure a patent.

(31) R. M. F. asks how to make a magic lantern out of a photographic camera. A. In the back of the camera, supported by a frame, insert a 5 inch double convex condenser. In the front remove the lens board, and in a special box made to fit closely over the camera front, secure the lens. At the back of this box arrange a frame to support the lantern slides, directly in front of the opening for the lens board. In a tin biscuit box at the rear of the camera insert a "Leader" kerosene lamp, with the edge of the flame toward the condenser. The box must have openings to admit air and places at the top to allow the free escape of heat, and should be fixed to slip over the back of the camera. By closing the camera bellows the condenser will be brought close to the front and adjacent to the lantern slide, where it should be. Other details to complete the lantern will be apparent to whoever wishes to try it.

(32) Enquirer asks (1) how photographic paper is made which will give black lines on a white ground at one operation. A. The paper is first coated with a solution of perchloride of iron and tartaric acid, dried and exposed in the usual way behind the tracing. The light reduces the perchloride of iron to the protochloride. The print is then immersed in a solution of gallic acid, which turns the coating of perchloride of iron, not acted upon by light, black, but does not affect the portions reduced by the light, hence, as the light cannot go through the black lines of the tracing, the sensitized surface under them blackens under the gallic acid. Lastly, the print is washed and dried. Owing to the powerful action of the gallic acid, it is difficult to obtain clear whites. 2. What is best mode of keeping leather of boots and shoes soft and pliable? Can a substance be mixed with the blacking for this purpose? A. In all tanned leathers, anything of the nature of currier's dubbing—or best cod oil and tallow, with perhaps a little resin—makes the best dressing for the leather to keep it pliable and help its lasting qualities. Blackings which have much grease cannot give a good polish, so it is best occasionally to thoroughly sponge off old blacking and rub the dressing well into the leather, when the surface will again polish after a few trials.

(33) H. W. H. asks how to make a small portable photographic apparatus. A. The simplest apparatus is to take a small sized starch box with sliding cover, and see that it is perfectly light tight. In one end make a hole one-eighth of an inch in diameter, over the outside of the hole glue a piece of brass as thin as a sheet of paper, then puncture as small a hole through the sheet of brass as possible, with a fine steel needle, twirling it to have the hole smooth. In the dark room insert the sensitive plate at the rear of the box, clamping it against the back by a small metal spring button. The cover is now closed, and a cloth thrown over the front to keep the light from striking the pin hole. The box can rest upon a chair or table, and pointed to the object; the cloth is lifted, and the exposure of 5, 10, to 20 seconds made according to the light. Development will follow as successfully as if an expensive lens had been used.

(34) W. C. B. asks: What is the formula for toning with chloride of platinum? A. Make a solution of 1 grain of bichloride of platinum to 10 ounces of water. The solution should be neutralized with carbonate of soda, and then slightly acidified with nitric acid. Immerse the prints in this solution, and tone as with chloride of gold. The results are not superior, and in many cases are not equal, to those obtained with ordinary gold toning solutions.

(35) J. C. B. asks: 1. How many feet of heating surface is in a tube of a vertical radiator 30 inches high? A. Iron pipe radiators with pipes from 30 to 31 inches long are rated at 1 square foot to a pipe. 2. How many feet of heating surface are required to heat 100 cubic feet of air, with thermometer at zero and room to be heated to 70°? A. One square foot or 1 radiator pipe; if the room is favorably situated, 10 to 20 per cent less. 3. A good work published on steam heating? A. Baldwin on Steam Heating, which we can mail for $2.50.

(36) T. H. P.—There appears to be no definite rule among engineers for the size of steam pipes to engines. Iron pipe being of certain definite sizes, the practice for engines of small size, 20 horse power and under, is, area of steam pipe should equal ⅛ indicated horse power. Larger engine, area of steam pipe one-seventh indicated horse power; 60 h. p. and upward, one-sixth indicated horse power. Areas to be in square inches. For long distances, as 2,000 feet, if well protected, one size larger may be safely used.

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(37) J. E. H. asks (1) how to make the solution for a bichromate battery (one gallon size) using two carbon, and one zinc (carbons 2½x4½ inches). A. Dissolve bichromate of potash in warm water to saturation. Pour the solution, while warm, into a vessel capable of resisting acids, and allow it to cool. Add sulphuric acid slowly to this solution until one pound of acid has been added for every pound of the solution, and finally add a small quantity of bisulphate of mercury, say one drachm to the pound of solution. 2. How to connect two or more such batteries together? A. If you want a "quantity" current, arrange the cells in parallel circuit, *i. e.*, connect all of the zincs with one conductor and all of the carbons with the other conductor. If you want an "intensity" current, arrange the cells in series, *i. e.*, connect the zinc of one cell with the carbon of the next, and so on; the zinc of the first cell and the carbon of the last cell being connected with the circuit wires. 3. How many volts would one (gallon size) battery be? A. About 1¾. 4. Would two or more such batteries double the number of volts in one? A. If connected in series, the electromotive force would be very nearly doubled. 5. How many such cells would I need for an Edison incandescent lamp, 6 candle power? A. Five or six.

(38) W. H. S. H. writes: 1. I want to put horseradish in bottles, in its pure state. Is anything put in to keep it, such as vinegar? A. The preparation is best made as follows: 6 tablespoonfuls scraped or grated horseradish, 1 tablespoonful white sugar, 1 quart vinegar. Scald the vinegar; pour boiling hot over the horseradish. Steep a week, strain, and bottle. Exposure to the air will discolor. 2. Is there such a thing as making inks by machinery? A. No. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 157. 3. How is bluing made by the barrel, 30 gallons, for the trade? A. Bluing in liquid form may consist of a mixture made up as follows: Take 4 ounces of soft Prussian blue, powder it, and put in a convenient vessel with one gallon of clear rain water, and add 1 ounce of oxalic acid. A teaspoonful of this mixture is sufficient for a large washing. 4. Give me a powder for horses and cattle. A. The following condition powder may be what you desire: Resin and niter each 2 ounces, levigated antimony 1 ounce; mix for 8 or 10 doses, and give one night and morning. When it is given to cattle, add 1 pound Glauber's salts.

(39) C. J. P. writes: We have a pear tree which has small sweet pears; it is also an early pear, but for several years they have black spots, become cracked and hard, and some are so very small. Can you tell me what to do with the tree, that it may bear better fruit? A. Enrich the ground round the outer roots of the tree with a liberal dressing of unbleached wood ashes.

(40) J. H. M. asks for a fireproof paint. A. Take a quantity of the best quicklime, and slake with water in a covered vessel; when the slaking is complete, water or skim milk, or a mixture of both, should be added to the lime, and mixed up to the consistency of cream; then there must be added at the rate of 20 pounds alum, 15 pounds of potash, and 1 bushel salt to every 100 gallons of creamy liquid. If the paint is required to be white, 6 pounds plaster of Paris or the same quantity of fine white clay is to be added to the above proportions of the other ingredients. All these ingredients being mingled, the mixture must be strained through a fine sieve and afterward ground in a color mill. When roofs are to be covered, or when crumbling brick walls are to be coated, fine white sand is mixed with the paint, in the proportion of 1 pound sand to 10 gallons of paint; this addition being made with a view of giving the ingredients a binding or petrifying quality. This paint should always be applied in a hot state, and in very cold weather precautions are necessary to keep it from freezing. Three coats of this paint are deemed, in most cases, sufficient. Any color may be obtained by adding the usual pigments to the composition.

(41) N. B. P. writes: I have a 2 inch tubular flowing well, 140 feet deep, which discharges 6 gallons of water per minute; and by attaching a pipe to the top of tube in well, I find that the water will rise 8 feet above the top of the well. I wish to convey a portion of the water to higher ground, 100 feet distant and 25 feet higher. Can I attach hydraulic ram directly to the top of the tube in well, and have it do good work, or will it be necessary to set rams on a lower level? If so, how much lower, and what distance from well? A. You can attach the ram directly to a reservoir at a distance above the ground that will insure a sufficient flow from the pipe, setting the ram as low as will admit of draining the waste water off; and in this way obtain 5 or 6 feet fall from the reservoir to the ram with a length of from 15 to 20 feet of pipe in a straight line. With this device and a flow into your cistern of 6 gallons per minute you may expect to discharge one gallon per minute into a reservoir 25 feet high. You cannot make the well pipe act as a ram pipe or feed. First find how much water will flow at a height something less than the height that it rises in the pipe above the ground, or level at which you can drain the water away.

(42) R. asks the reason that cast iron water pipes on being tested will burst at a low pressure when they contain air, whereas the same pipes will stand a very much higher pressure if all the air is allowed to escape from them before the pressure is applied. A. Pipes of iron or any other material will stand the pressure of water, air and water, or air alone, to the same extent, provided there is no disturbance to produce a water ram or hammer, which alone is the cause of the cracking of cast iron or other brittle pipes under low pressure. Letting water into pipes quickly generates waves along the pipe that has been known to crack cast iron pipes of large size without any pressure.

(43) J. N. H. asks the proper proportions and materials for a good fireproof cement, which when hard shall be solid and firm and not liable to crush easily. A. To 4 or 5 parts of clay, thoroughly dried and pulverized, add 2 parts of fine iron filings free from oxide, 1 part manganese dioxide, ½ part of sea salt, and ⅛ part of borax. Mingle these thoroughly and render them as fine as possible, then reduce them to a thick paste with the necessary quantity of water, mixing thoroughly well. It must be used immediately. After application it should be exposed to a heat gradually increasing to almost a white heat. This cement is very hard, and presents complete resistance to a red heat and boiling water.

(44) A. A.—Stenciling is done on glass in the same manner as on window shades and for fresco figures on ceilings. Cut the patterns in oiled paper or bookbinders' press boards. Lay the pattern on the work, holding it firmly, and with a medium stiff brush fill in the spaces with the desired colors.

(45) T. W. B. writes: I have 59 tubes to portable boiler. To-day they all leak, to-morrow only a few, and in the course of two or three days they all stop, or nearly so. Then they commence leaking, say two or three, at bottom; then change to one side, where several will leak for two or three days, and then cease leaking on that side, and change once to the other side of furnace. Can you explain this? It is an enigma to me. After expanding tubes, should the bedding be reset to flue sheet? What is the distance between centers of 5 foot 6 inch and 2 foot pulleys for 80 foot belt? A. The tubes that leak are not tight in the head, which allows a slight movement of the tube in its socket by pressure in raising steam, and also by variation of pressure in boiler during the day. The sediment in the boiler tends to stop the leaks by percolation. Getting up steam the next day will again spring the head and start some of the loose tubes leaking. The fact of their leaking on alternate sides we think accidental; much depends on the kind of expander that is used. A roller expander should have the ends of the tubes beaded over to insure stability of the head under pressure. Distance between centers or pulleys should be 34 feet 1 inch.

(46) W. L. T.—It is a very difficult process for an amateur to make good japan varnish. Better buy the red japan from a varnish maker, and thin it with turpentine to the proper consistency for dipping. It will do for wood, but requires two coats, as the first coat dries in and will not give a gloss. The hard japans require 260° for baking. There are japans that are not so tough, that dry at 212° upward, and others that are called air-drying japans.

(47) J. N.—Fresh brewer's yeast will cause bread to rise in 2 to 4 hours' time. The following recipe is used for aerated bread: Divide 3 pounds flour into two portions; mix up the first with water, holding in solution 2 ounces bicarbonate of soda, then mix the second portion of flour with water, to which 1 ounce of muriatic acid has been added; knead each mass of the dough thoroughly. When this is done, mix both portions together as rapidly and perfectly as possible, form the mass into loaves, and bake immediately. This bread contains no yeast, and is very wholesome. You can, if you prefer, use a baking powder such as the following:

Powdered cream tartar	30 ounces.
Bicarbonate of soda	15 "
Flour	6 "

All well dried; mix thoroughly and keep dry.

(48) T. W. writes: I have an opera glass with achromatic objective $1\frac{5}{8}$ inches in diameter and 4½ inches focus. Can I use it for making stereoscopic views with camera? A. You can, but with a limited field; it needs two sets for a proper arrangement for a stereoscopic lantern.

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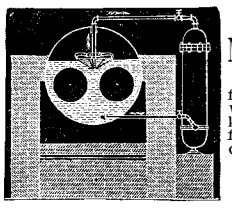

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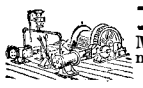

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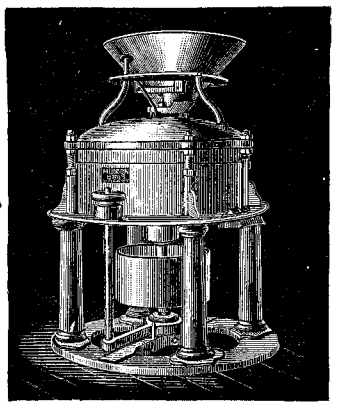

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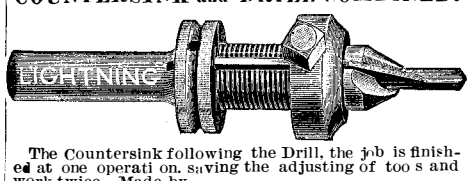

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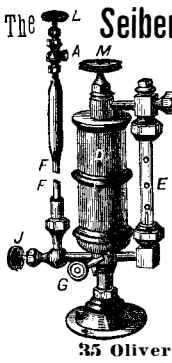

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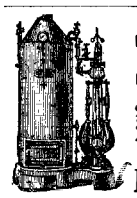

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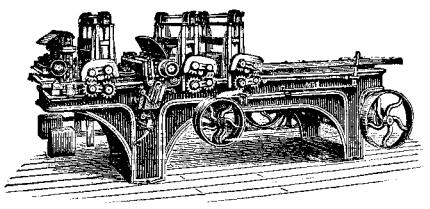

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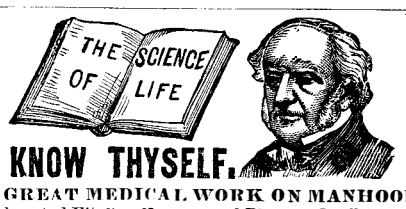

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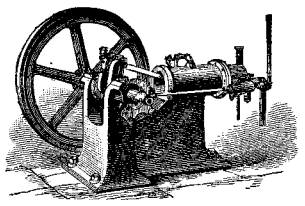

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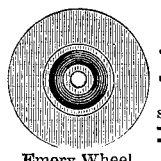

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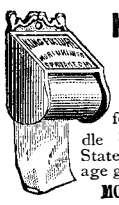

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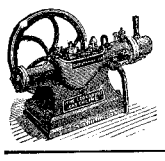

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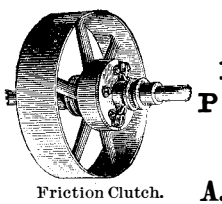

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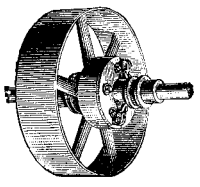

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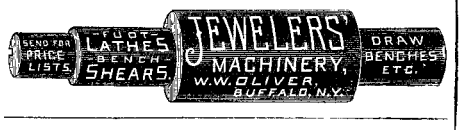

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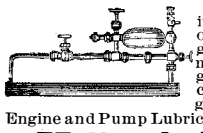

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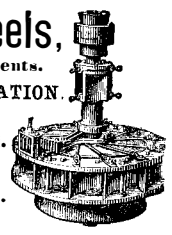

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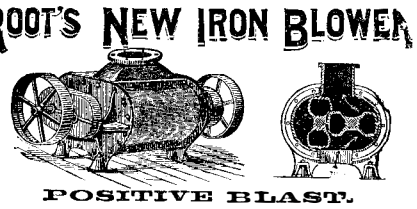

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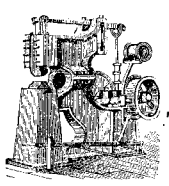

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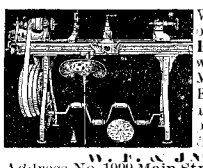

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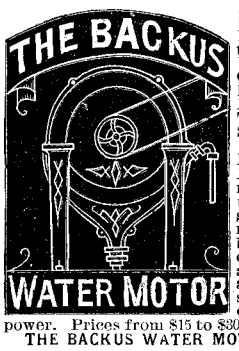

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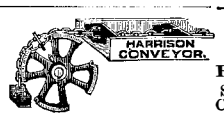

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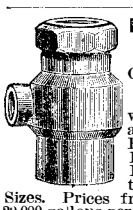

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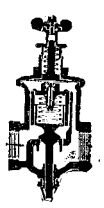

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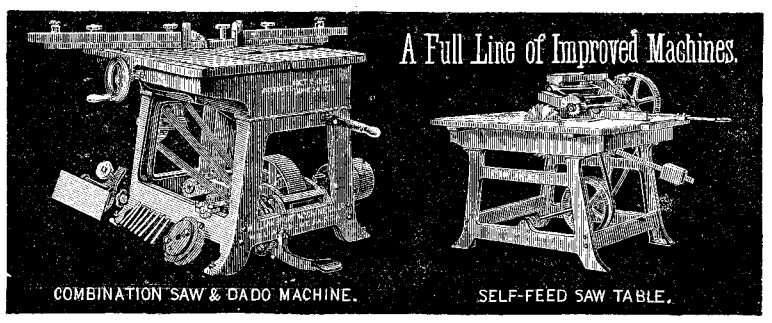

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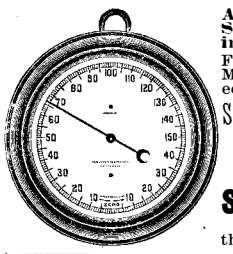

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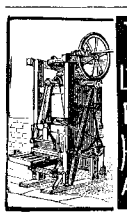

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